

# A taxonomic revision of *Ricinocarpos* Desf. (Euphorbiaceae: *Ricinocarpeae*, *Ricinocarpinae*)

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## Summary

Halford, D.A. & Henderson, R.J.F. (2007). A taxonomic revision of *Ricinocarpos* Desf. (Euphorbiaceae: *Ricinocarpeae*, *Ricinocarpinae*). *Austrobaileya* 7(3): 387–449. The genus *Ricinocarpos* Desf. is endemic to Australia. Twenty-eight species are recognised as belonging to it, and a key is provided for their identification. The following species are described here as new: *R. brevis* R.J.F.Hend. & Mollemans, *R. caniana* Halford & R.J.F.Hend., *R. crispatus* Halford & R.J.F.Hend., *R. graniticus* Halford & R.J.F.Hend., *R. linearifolius* Halford & R.J.F.Hend., *R. megalocarpus* Halford & R.J.F.Hend., *R. oliganthus* Halford & R.J.F.Hend., *R. pilifer* Halford & R.J.F.Hend., *R. ruminatus* Halford & R.J.F.Hend., *R. trachyphyllus* Halford & R.J.F.Hend., *R. trichophyllus* Halford & R.J.F.Hend. and *R. verrucosus* Halford & R.J.F.Hend. The new species are illustrated and distinguished from similar species while all taxa are described and mapped, and notes on their habitat, distribution and phenology are given. Lectotypes are chosen for *R. ledifolius* F.Muell., *R. marginatus* Benth., *R. muricatus* Müll.Arg., *R. pinifolius* Desf., *R. rosmarinifolius* Benth., *R. stylosus* Diels and *R. velutinus* F.Muell. *Ricinocarpos glaucus* var. *jasminoides* Baill. is neotypified. All known synonyms are listed here including phrase names that were used to identify taxa prior to their formal naming in this publication.

Key Words: Euphorbiaceae, *Ricinocarpos*, *Ricinocarpos brevis*, *Ricinocarpos caniana*, *Ricinocarpos crispatus*, *Ricinocarpos graniticus*, *Ricinocarpos linearifolius*, *Ricinocarpos megalocarpus*, *Ricinocarpos oliganthus*, *Ricinocarpos pilifer*, *Ricinocarpos ruminatus*, *Ricinocarpos trachyphyllus*, *Ricinocarpos trichophyllus*, *Ricinocarpos verrucosus*, Australia, Australian flora, taxonomy, nomenclature, identification keys

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## Introduction

*Ricinocarpos* Desf. is endemic to Australia with twenty-eight species recognised in the present revision. All species are woody, perennial shrubs or rarely small trees and the majority (twenty-six species) grow in shrubland, heathland or dry sclerophyll open forest or woodland communities, generally in sandy soils. One species (*R. speciosus* Müll.Arg.) occurs in wet sclerophyll forest communities, while another species (*R. ledifolius* F.Muell.) grows in vine thicket or vine forest communities.

The genus was established by Desfontaines in 1817 to include a single species, *R. pinifolius*, based on material collected by botanists in 1802 at Port Jackson, New South Wales, during the visit of the Baudin Expedition (Desfontaines 1817). Desfontaines coined

the name for his new genus from the generic name *Ricinus* L. (from Latin ‘*ricinus*’, a tick, in reference to the appearance of the seeds of that genus) and Greek ‘*karpós*’, fruit, because of the resemblance of its fruits to those in the genus *Ricinus*.

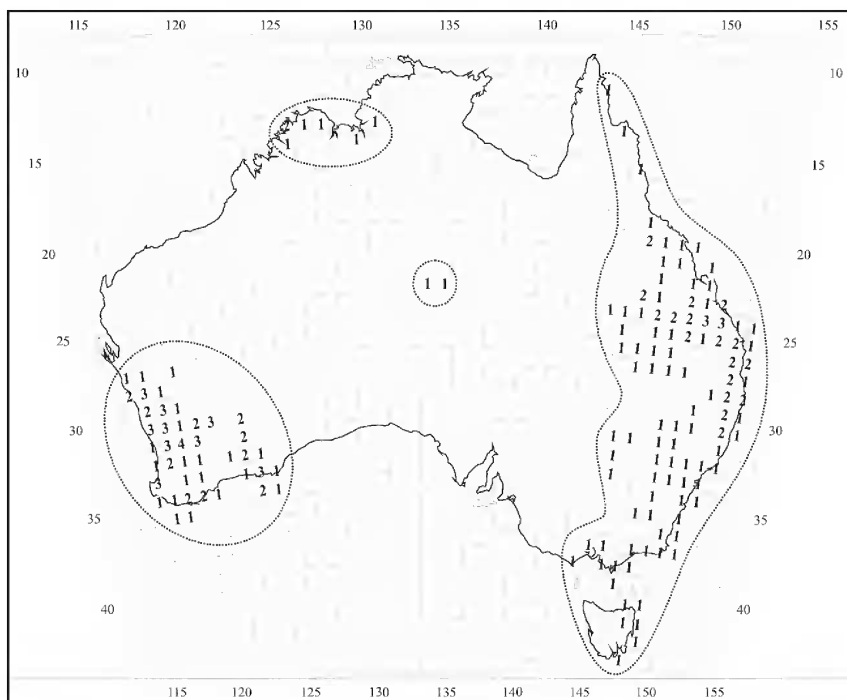
At the time, Desfontaines considered *Ricinocarpos* allied to *Jatropha* L. but differing from that genus by having a 5-petalled corolla, a staminal column bearing anthers from the base to the apex, echinate fruit and a different overall habit. Since the 1860s, *Ricinocarpos* has been consistently linked to *Beyeria* Miq. within the Euphorbiaceae (Müller 1865, 1866; Baillon 1874; Bentham 1880; Grüning 1913). In the most recent taxonomic placement, Webster (1994) included *Ricinocarpos* in Euphorbiaceae subfamily *Crotonoideae* Pax, tribe *Ricinocarpeae* Müll.Arg., subtribe *Ricinocarpinae* Webster, together with *Beyeria* and *Alphandia* Baill. Molecular studies of

the uniovulate Euphorbiaceae (Wurdack *et al.* 2005) strongly supported the close relationship of *Ricinocarpus* and *Beyeria* as well as with another endemic Australian genus *Bertya* Planch. Halford and Henderson (2005) established the genus *Shonia* R.J.F.Hend. & Halford to accommodate *Beyeria tristigma* and its allies which are closely related to *Ricinocarpus*. *Ricinocarpus* is distinguished from *Beyeria*, *Shonia* and *Bertya* by the following combination of features: flowers in umbelliform clusters or racemes or solitary, petals mostly present in both male and female flowers, disc present in both male and female flowers, styles 3-limbed with limbs spreading to divergent and 3–5-lobed. For a key to the Australian genera of the tribe *Ricinocarpeae* refer to Halford and Henderson (2005).

*Ricinocarpus* is widespread in Australia and is present in all states except South Australia (**Map 1**). It is notably absent from most of the arid zone, with the majority of

species occurring in two disjunct regions. The greatest species concentration is in south-western Australia where fourteen species occur. The second area of concentration is in eastern Australia where ten species are recorded. Three species occur in north-western Australia and one species (*R. gloria-medii*) is from central Australia. All species are endemic in the particular region in which they occur.

*Ricinocarpus pinifolius* is the most wide-ranging species in the genus. It is recorded in 47 1° grid squares across an area from the central coast of Queensland southwards to southern Tasmania. By contrast, ten species (*R. brevis*, *R. caniana*, *R. gloria-medii*, *R. marginatus*, *R. oliganthus*, *R. pilifer*, *R. rosmarinifolius*, *R. ruminatus*, *R. trichophorus* and *R. tuberculatus*) have very restricted distributions each occurring in only one or two 1° grid squares throughout Australia (**Table 1**).



**Map 1.** Distribution of *Ricinocarpus* in Australia indicating the number of species in each 1° grid square.



Species	No. of 1° grid squares	region
<i>R. pinifolius</i>	47	E
<i>R. ledifolius</i>	19	E
<i>R. linearifolius</i>	16	E
<i>R. muricatus</i>	15	SW
<i>R. velutinus</i>	14	SW
<i>R. bowmanii</i>	13	E
<i>R. undulatus</i>	12	SW
<i>R. trachyphyllus</i>	9	E
<i>R. speciosus</i>	8	E
<i>R. glaucus</i>	7	SW
<i>R. trichophyllus</i>	5	NW
<i>R. megalocarpus</i>	5	SW
<i>R. crispatus</i>	4	E
<i>R. cyanescens</i>	4	SW
<i>R. stylosus</i>	4	SW
<i>R. verrucosus</i>	3	E
<i>R. graniticus</i>	3	SW
<i>R. psilocladus</i>	3	SW
<i>R. gloria-medii</i>	2	C
<i>R. caniana</i>	2	E
<i>R. ruminatus</i>	2	E
<i>R. rosmarinifolius</i>	2	NW
<i>R. trichophorus</i>	2	SW
<i>R. brevis</i>	1	E
<i>R. marginatus</i>	1	NW
<i>R. oliganthus</i>	1	SW
<i>R. pilifer</i>	1	SW
<i>R. tuberculatus</i>	1	SW

**Table 1.** Frequency of *Ricinocarpus* species in Australia, based on the number of 1° grid squares in which they are found.

abbreviations: E = eastern Australia;  
SW = south-western Australia;  
NW = north-western Australia;  
C = central Australia.

### Classification within *Ricinocarpus*

J. Müller (1865, 1866) divided *Ricinocarpus* into three sections, namely *R. sect. Anomodiscus*, *R. sect. Euricinocarpus* (*nom.*

*inval.* = *R. sect. Ricinocarpus*) and *R. sect. Apetalidion*. These sections were based on the presence or absence of petals and disc attachment in flowers. *Ricinocarpus* *sect. Anomodiscus* contained a single species *R. major* Müll.Arg., *R. sect. Euricinocarpus* (= *R. sect. Ricinocarpus*) contained eight species, while *R. sect. Apetalidion* contained a single species, *R. muricatus* Müll.Arg. The eight species in *R. sect. Ricinocarpus* were arranged into two informal groups based on flower arrangement. Group one had flowers more or less solitary or in cymose inflorescences (*R. speciosus* Müll.Arg., *R. pinifolius* Desf., *R. cyanescens* Müll.Arg., *R. glaucus* Endl., *R. tuberculatus* Müll.Arg., *R. bowmanii* F.Muell. and *R. ledifolius*). Group two had flowers in racemose inflorescences (*R. trichophorus* Müll.Arg.).

In his account of *Ricinocarpus* in *Flora Australiensis*, Benth (1873) recognised thirteen species, the ten species dealt with by J. Müller in de Candolle's *Prodromus* (1866), two new species (*R. rosmarinifolius* Benth. and *R. marginatus* Benth.) and *Bertya gummifera* var. *psiloclada* Müll.Arg. which he transferred to *Ricinocarpus* as *R. psiloclada* (Müll.Arg.) Benth. Benth did not recognise any subdivisions within the genus and made no comment regarding Müller's sections. The species *R. rosmarinifolius* Benth., *R. marginatus* Benth. and *R. psiloclada* (Müll. Arg.) Benth. would have been referable to *R. sect. Ricinocarpos* had Benth recognised the sectional divisions established by Müller.

In the most recent and comprehensive treatment of *Ricinocarpus*, Grüning (1913) recognised fifteen species. They included the thirteen species dealt with by Benth (1873) plus *R. velutinus* F.Muell. and *R. stylosus* Diels. Grüning grouped them into four sections, namely the three sections erected by J. Müller (1865), *R. sect. Euricinocarpus* Müll.Arg. (= *R. sect. Ricinocarpos*), *R. sect. Anomodiscus* Müll.Arg., *R. sect. Polystaphylos* Grüning (*nom. illeg.* = *R. sect. Apetalidion* Müll.Arg.) and a fourth *R. sect. Sissostylus* Grüning erected to accommodate *R. stylosus*. *Ricinocarpus velutinus* F.Muell. was placed in *R. sect. Ricinocarpos*.

Although the great majority (twenty five) of the species we accept occur in a single section (*R. sect. Ricinocarpos*), we believe that continued recognition of these sections is useful in understanding the genus. In the present account, we have maintained the sectional classification presented by Grüning (1913) except for *R. sect. Anomodiscus* which contains *R. major*. Bentham (1873) and Grüning (1913) both independently question the placement of *R. major* Müll.Arg. within *Ricinocarpos*. From our examination of the specimen on which this name is based (microfiche and a fragment in MEL), we believe that the taxon that it represents does not belong in *Ricinocarpos* and most probably does not belong in Euphorbiaceae. We have seen no other specimens that match this material during our studies. We have, therefore, excluded *R. major* and *R. sect. Anomodiscus* from the current revision.

For the distinguishing characters of the sections of *Ricinocarpos* refer to the 'taxonomy' section below. As stated previously, *Ricinocarpos* sect. *Ricinocarpos* contains the majority of species. In the following taxonomic treatment the species within *R. sect. Ricinocarpos* are listed alphabetically. However, although not formalised here, there are clear morphological groupings of species within this section that we suggest may reflect shared ancestry. The characters are summarised in **Table 2**. These groups are:

**The *R. pinifolius* group.** Young branchlets glabrous. Young shoots and buds non resinous. Adaxial surface of leaves glabrous, non resinous. Flowers solitary or in  $\pm$  umbelliform inflorescences. Calyx deciduous in fruit. Petals at least twice as long as calyx. Style  $\pm$  obsolete, many times shorter than stigmatic limbs. Fruit glabrous, spiculate, tuberculate, verrucose or smooth. Five species included from south-western Australia and eastern Australia: *R. cyanescens*, *R. megalocarpus*, *R. pinifolius*, *R. ruminatus* and *R. tuberculatus*.

**The *R. glaucus* group.** Young branchlets hairy with simple hairs in longitudinal bands. Young shoots and buds non resinous. Adaxial surface of leaves glabrous, non resinous. Flowers

solitary or in  $\pm$  umbelliform inflorescences. Calyx persistent in fruit. Petals at least twice as long as calyx. Style  $\pm$  obsolete, many times shorter than stigmatic limbs. Fruit glabrous or hairy, smooth. Three species included from south-western Australia: *R. glaucus*, *R. pilifer* and *R. undulatus*.

**The *R. psilocladus* group.** Young branchlets glabrous. Young shoots and buds resinous. Adaxial surface of leaves glabrous, usually resinous. Flowers solitary or in  $\pm$  umbelliform inflorescences. Calyx persistent in fruit. Petals slightly longer to twice as long as calyx. Style  $\pm$  obsolete, many times shorter than stigmatic limbs. Fruit glabrous,  $\pm$  smooth, resinous. Three species included from south-western Australia: *R. graniticus*, *R. oliganthus* and *R. psilocladus*.

**The *R. bowmanii* group.** Young branchlets stellate hairy. Young shoots and buds non resinous. Adaxial surface of leaves stellate hairy at least when young, non resinous. Flowers solitary or in  $\pm$  umbelliform inflorescences. Calyx persistent in fruit. Petals slightly shorter to twice as long as calyx. Style  $\pm$  obsolete, many times shorter than stigmatic limbs. Fruit densely stellate hairy. Nine species included from eastern Australia, central Australia and south-western Australia: *R. bowmanii*, *R. brevis*, *R. caniana*, *R. crispatus*, *R. gloria-medii*, *R. ledifolius*, *R. linearifolius*, *R. speciosus* and *R. trachyphyllus*.

**The *R. marginatus* group.** Young branchlets stellate hairy. Young shoots and buds non resinous. Adaxial surface of leaves stellate hairy at least along the margins and midline, non resinous. Flowers in  $\pm$  umbelliform inflorescences. Calyx persistent in fruit. Petals  $\pm$  equalling or shorter than calyx. Style conspicuous,  $\pm$  equalling in length stigmatic limbs. Fruit stellate hairy. Three species included from north-western Australia: *R. marginatus*, *R. rosmarinifolius* and *R. trichophyllus*.

**The *R. trichophorus* group.** Young branchlets stellate hairy. Young shoots and buds non resinous. Adaxial surface of leaves stellate hairy, non resinous. Flowers in racemose inflorescences. Calyx persistent in fruit. Petals

slightly longer or up to twice as long as calyx. Style obscure, many times shorter in length than stigmatic limbs. Fruit stellate hairy.

Two species included from south-western Australia: *R. trichophorus* and *R. velutinus*.

Characters			1	2	3	4	5	6
<b>Young branchlets</b>								
	indumentum	absent	+		+			
		simple hairs		+		+	+	+
		stellate hairs						
<b>Young shoots and buds</b>								
		resinous	+	+	+	+	+	+
		non resinous						
<b>Adaxial surface of leaves</b>								
	indumentum	absent	+	+	+			
		stellate hairs				+	+	+
	resinous	resinous			+			
		non resinous	+	+		+	+	+
<b>Arrangement of flowers</b>								
		solitary	+	+	+	+		
		± umbelliform inflorescence	+	+	+	+	+	
		racemose inflorescence						+
<b>Calyx</b>								
		persistent in fruit		+	+	+	+	+
		deciduous in fruit	+					
<b>Petals</b>								
		longer than calyx	+	+	+	+		+
		equal calyx				+	+	
		shorter than calyx				+	+	
<b>Style</b>								
		± obsolete or obscure	+	+	+	+		+
		conspicuous					+	
<b>Fruit</b>								
	indumentum	absent	+	+	+			
		stellate hairs		+		+	+	+
	surface texture	smooth	+	+	+	+	+	+
		variously textured	+					
	resinous	resinous			+			
		non resinous	+	+		+	+	+

**Table 2.** Summary of morphological characters of informal groups of *Ricinocarpus* sect. *Ricinocarpus*.

1 = *R. pinifolius* group, 2 = *R. glaucus* group, 3 = *R. psilocladus* group, 4 = *R. bowmanii* group, 5 = *R. marginatus* group, 6 = *R. trichophorus* group

**Materials and methods**

This revision is based on an assessment of morphological characters of about 1050 dried herbarium collections, and collections and field studies undertaken by the second author from 1988 to 1992. Herbarium collections

from herbaria AD, BRI, CANB, HO, MEL, NE, NSW and PERTH were studied and annotated, and selected material from B, G and K was also seen. Acronyms used here and elsewhere to indicate herbaria holding particular specimens are those listed by

Holmgren *et al.* (1990). All specimens cited have been examined by one or both of the authors, unless indicated otherwise by 'n.v'.

Descriptions of colour for vegetative and floral parts are either from the information on herbarium labels or from photographs taken by the second author during field studies. Measurements listed are based upon the total variation observed in the herbarium specimens examined. Information on plant size, flowering and fruiting times, and habitat of occurrence was obtained from herbarium labels. All measurements were made either on fresh material, dried material, material preserved in 70% ethanol or dried material reconstituted by placing in boiling water for a few minutes. The distribution maps were produced with MapInfo Version 3 and are based on herbarium specimen locality data.

### Taxonomy

***Ricinocarpus*** Desf., *Mém. Mus. Hist. Nat.* 3: 459, t. 22 (1817). **Type:** *Ricinocarpus pinifolius* Desf.

[*Roeperia auct. non* Adr.Juss.: C.P.J.Sprengal, *Syst. Veg.* 16<sup>th</sup> edn, 3: 147 (1826)]

Monoecious or apparently sometimes dioecious **shrubs, rarely small trees**; branches glabrous or with an indumentum of stellate or rarely simple hairs. **Leaves** spirally alternate or rarely subopposite, exstipulate, petiolate or rarely sessile, simple, entire, margins flat, recurved or revolute, marginal glands absent or present on blade proximally.

**Inflorescences** of a single male or female flower, or  $\pm$  umbelliform with either all male flowers or one or two central female flowers surrounded by several male flowers, or

racemose with all female or all male flowers or one or two female flowers basal on the axis with numerous male flowers distal to them, terminal on branchlets or sometimes appearing axillary due to reduction of lateral branchlet, bracteose or frondobracteose.

**Flowers** mostly conspicuous, pedicellate, mostly bracteolate, gamosepalous; calyx deeply 5(rarely 4 or 6)-lobed, lobes subequal, imbricate (quincuncial); petals mostly 5(rarely 4, 6, 7 or absent), imbricate (convolute or rarely quincuncial), mostly equalling or longer than calyx; disc present, of discrete alternipetalous glands or forming a continuous glandular ring.

**Male flowers:** stamens numerous ( $> 15$ ), erect to spreading from central column formed by fusion of bases of filaments; anthers dorsifixed, extrorse, of two separate obloid, parallel but contiguous locules each lateral on slightly swollen connective at the apex of filament, dehiscing by longitudinal slits; pistillode absent. **Female flowers:** calyx lobes persistent or caducous; petals often marcescent; ovary 3-locular with one pendant ovule in each locule; style short or  $\pm$  obsolete; stigma with 3 horizontally spreading and divergent limbs; limbs deeply 2(rarely 3 to 5)-lobed, red, persistent. **Fruits** capsular, ellipsoid, ovoid or subglobose, mostly trilobate, glabrous or densely hairy, smooth, tuberculate, rugose, verrucose or spiculate, mostly 3-seeded, separating septically into three 2-valved cocci leaving a persistent columella. **Seeds** ovoid to ellipsoid and usually dorsi-ventrally compressed, carunculate; testa smooth, shiny, often blotched; caruncle waxy-fleshy creamy-white to yellowish-white; endosperm copious; embryo linear, in the middle of the endosperm, cotyledons longer than the radicle.

### Key to sections of *Ricinocarpus*

1. Flowers with petals and sepals . . . . . **R. sect. *Ricinocarpus*** (25 species)  
Flowers without petals (sepals only present) . . . . . **2**
2. Flowers solitary or in umbelliform inflorescences . . . . . **R. sect. *Scissostylus*** (1 species)  
Flowers in racemose inflorescences . . . . . **R. sect. *Apetalidion*** (2 species)

**Key to species of *Ricinocarpos***

1. Young branchlets glabrous or with minute simple hairs . . . . . **2**  
     Young branchlets with stellate hairs . . . . . **15**
2. Flowers lacking petals (sepals only present) . . . . . **3**  
     Flowers with petals and sepals . . . . . **5**
3. Leaf blades < 15 mm long (W.A.) . . . . . **26. *R. stylosus***  
     Leaf blades ≥ 15 mm long . . . . . **4**
4. Adaxial surface of calyx lobes glabrous (W.A.) . . . . . **27. *R. muricatus***  
     Adaxial surface of calyx lobes pubescent (Qld) . . . . . **28. *R. verrucosus***
5. Young branchlets minutely hairy in two longitudinal bands . . . . . **6**  
     Young branchlets glabrous . . . . . **8**
6. Ovaries and fruits hairy (W.A.) . . . . . **14. *R. pilifer***  
     Ovaries and fruits glabrous . . . . . **7**
7. Abaxial surface of leaf blades with a sericeous indumentum; hairs ±  
     straight (W.A.) . . . . . **24. *R. undulatus***  
     Abaxial surface of leaf blades with a woolly indumentum;  
     hairs crispate (W.A.) . . . . . **6. *R. glaucus***
8. Young shoots and flower buds resinous; adaxial surface of calyx lobes  
     glabrous . . . . . **9**  
     Young shoots and flower buds not resinous; adaxial surface of calyx lobes  
     hairy . . . . . **11**
9. Leaf blades < 15 mm long (W.A.) . . . . . **13. *R. oliganthus***  
     Leaf blades ≥ 15 mm long . . . . . **10**
10. Leaf blades linear to narrow-oblong or very narrow-obovate, (1.5–) 2.5–6  
     mm wide, with adaxial surface tuberculate and margins recurved but  
     with most of the abaxial surface of the leaf blade visible (W.A.) . . . . **16. *R. psilocladus***  
     Leaf blades linear, ≤ 1.5 mm wide, with adaxial surface smooth and  
     margins recurved to revolute so that only midrib of abaxial surface of the  
     leaf blade is visible (W.A.) . . . . . **8. *R. graniticus***
11. Fruits spiculate, densely covered with subulate processes . . . . . **12**  
     Fruits smooth or tuberculate . . . . . **13**
12. Fruits 14–16 mm long, 14–16 mm across; seeds ellipsoid, 9.5–10 mm  
     long, 6–6.5 mm across; caruncles ruminant (Qld) . . . . . **18. *R. ruminatus***  
     Fruits 8–12 mm long, 10–14 mm across; seeds ovoid, 5.5–9 mm long,  
     3.2–4.2 mm across; caruncles ± smooth (N.S.W., Qld, Tas., Vic.) . . . . **15. *R. pinifolius***
13. Fruits tuberculate, 14–16 mm long, 10–13 mm across (W.A.) . . . . . **12. *R. megalocarpus***  
     Fruits smooth to tuberculate, 10–12 mm long, 5–8 mm across . . . . . **14**
14. Leaf blades 7–12 mm long, 1–1.7 mm wide, with a length/width ratio <  
     12:1 (W.A.) . . . . . **5. *R. cyanescens***  
     Leaf blades 10–25 mm long, 0.8–1.3 mm wide, with a length/width ratio  
     ≥ 12:1 (W.A.) . . . . . **23. *R. tuberculatus***



15. Inflorescences terminal, racemose . . . . . 16  
 Inflorescences terminal or axillary, of a single flower or umbelliform . . . . . 17
16. Young shoots and inflorescence with a ferruginous indumentum; adaxial surface of leaf blades stellate-pubescent when young soon becoming glabrous; petals white (W.A.) . . . . . 21. *R. trichophorus*  
 Young shoots and inflorescence with a greyish-white indumentum; adaxial surface of leaf blades with moderately dense indumentum of persistent stellate hairs; petals yellow (W.A.) . . . . . 25. *R. velutinus*
17. Petals < 3.5 mm long . . . . . 18  
 Petals ≥ 3.5 mm long . . . . . 21
18. Leaf blades ≥ 8 mm wide, margins ± flat (W.A.) . . . . . 11. *R. marginatus*  
 Leaf blades < 8 mm wide, margins recurved . . . . . 19
19. Leaf blades < 20 mm long (W.A.) . . . . . 2. *R. brevis*  
 Leaf blades ≥ 20 mm long . . . . . 20
20. Adaxial surface of leaf blades moderately to densely stellate-pubescent; hairs with a short stout stipe (N.T., W.A.) . . . . . 22. *R. trichophyllus*  
 Adaxial surface of leaf blades ± glabrous except for scattered sessile stellate hairs especially along the midline (W.A.) . . . . . 17. *R. rosmarinifolius*
21. Petals < 6 mm long . . . . . 22  
 Petals ≥ 6 mm long . . . . . 25
22. Margins of leaf blades recurved with most of the abaxial surface of the leaf blade visible (Qld) . . . . . 9. *R. ledifolius*  
 Margins of leaf blades recurved to revolute so that only the midrib of the abaxial surface of the leaf blade is visible . . . . . 23
23. Fruits < 7 mm long (Qld) . . . . . 4. *R. crispatus*  
 Fruits ≥ 7 mm long . . . . . 24
24. Abaxial surface of leaf blades with a pubescent indumentum (W.A.) . . . . . 2. *R. brevis*  
 Abaxial surface of leaf blades with a sericeous indumentum (N.S.W., Qld) . . . . . 10. *R. linearifolius*
25. Adaxial surface of leaf blades hairy becoming glabrous and scabrid by the persistent tuberculate bases of deciduous hairs . . . . . 26  
 Adaxial surface of leaf blades stellate-pubescent when young becoming glabrous and smooth . . . . . 27
26. Abaxial surface of leaf blades pubescent with stellate hairs up to 0.4 mm across (N.S.W.) . . . . . 1. *R. bowmanii*  
 Abaxial surface of leaf blades sericeous with stellate hairs up to 2 mm across (N.S.W., Qld) . . . . . 20. *R. trachyphyllus*
27. Leaf blades ≥ 7 mm wide (N.S.W., Qld) . . . . . 19. *R. speciosus*  
 Leaf blades < 7 mm wide . . . . . 28
28. Margins of leaf blades recurved with most of the abaxial surface of the leaf blade visible (Qld) . . . . . 3. *R. caniana*  
 Margins of leaf blades recurved to revolute so that only the midrib on the abaxial surface of the leaf blade is visible . . . . . 29

29. Abaxial surface of leaf blades with a sericeous indumentum; petioles < 2 mm long (N.S.W., Qld) . . . . . **10. R. linearifolius**  
 Abaxial surface of leaf blades with a tomentose indumentum; petioles 2–3 mm long (N.T.) . . . . . **7. R. gloria-medii**

### Regional keys

The following regional keys are given as supplementary to the general key because the identification of a specimen belonging to *Ricinocarpos* is much simplified if the geographical source is known.

#### Key to species of *Ricinocarpos* in south-western Australia

1. Young branchlets with stellate hairs . . . . . **2**  
 Young branchlets glabrous or with minute simple hairs . . . . . **4**
2. Inflorescences terminal or axillary, of a single flower or umbelliform . . . . . **2. R. brevis**  
 Inflorescences terminal, racemose . . . . . **3**
3. Young shoots and inflorescence with a ferruginous indumentum; adaxial surface of leaf blades stellate-pubescent when young soon becoming glabrous; petals white . . . . . **21. R. trichophorus**  
 Young shoots and inflorescence with a greyish-white indumentum; adaxial surface of leaf blades with moderately dense indumentum of persistent stellate hairs; petals yellow . . . . . **25. R. velutinus**
4. Flowers lacking petals (sepals only present) . . . . . **5**  
 Flowers with petals and sepals . . . . . **6**
5. Leaf blades < 15 mm long, inflorescences of a single flower or umbelliform . . . . . **26. R. stylosus**  
 Leaf blades ≥ 15 mm long; inflorescences racemose . . . . . **25. R. muricatus**
6. Young branchlets minutely hairy in two longitudinal bands . . . . . **6**  
 Young branchlets glabrous . . . . . **8**
6. Ovaries and fruits hairy . . . . . **14. R. pilifer**  
 Ovaries and fruits glabrous . . . . . **7**
7. Abaxial surface of leaf blades with sericeous indumentum; hairs ± straight . . . . . **24. R. undulatus**  
 Abaxial surface of leaf blades with woolly indumentum; hairs crisped . . . . . **6. R. glaucus**
8. Young shoots and flower buds resinous; adaxial surface of calyx lobes glabrous . . . . . **9**  
 Young shoots and flower buds not resinous; adaxial surface of calyx lobes hairy . . . . . **11**
9. Leaf blades < 15 mm long . . . . . **13. R. oliganthus**  
 Leaf blades ≥ 15 mm long . . . . . **10**
10. Leaf blades linear to narrow-oblong or very narrow-obovate, (1.5–) 2.5–6 mm wide, with adaxial surface tuberculate and margins recurved but with most of the abaxial surface of the leaf blade visible . . . . . **16. R. psilocladus**  
 Leaf blades linear ≤ 1.5 mm wide, with adaxial surface smooth and margins recurved to revolute so that only midrib of abaxial surface of the leaf blade is visible . . . . . **8. R. graniticus**

11. Fruits tuberculate, 14–16 mm long, 10–13 mm across . . . . . **12. R. megalocarpus**  
 Fruits smooth to tuberculate, 10–12 mm long, 5–8 mm across . . . . . **12**
12. Leaf blades 7–12 mm long, 1–1.7 mm wide, with a length/width ratio < 12:1 . . . . . **5. R. cyanescens**  
 Leaf blades 10–25 mm long, 0.8–1.3 mm wide, with a length/width ratio ≥ 12:1 . . . . . **23. R. tuberculatus**

### Key to species of *Ricinocarpus* in eastern Australia

1. Young branchlets glabrous or with minute simple hairs . . . . . **2**  
 Young branchlets with stellate hairs . . . . . **4**
2. Flowers lacking petals (sepals only present); fruits tuberculate (Qld) . . . **26. R. verrucosus**  
 Flowers with petals and sepals; fruits spiculate, densely covered with subulate processes . . . . . **3**
3. Fruits 8–12 mm long, 10–14 mm across; seeds ovoid, 5.5–9 mm long, 3.2–4.2 mm across; caruncles ± smooth (N.S.W., Qld, Tas., Vic.) . . . . . **15. R. pinifolius**  
 Fruits 14–16 mm long, 14–16 mm across; seeds ellipsoid, 9.5–10 mm long, 6–6.5 mm across; caruncles ruminant (Qld) . . . . . **18. R. ruminatus**
4. Petals < 6 mm long . . . . . **5**  
 Petals ≥ 6 mm long . . . . . **7**
5. Margins of leaf blades recurved with most of the abaxial surface of the leaf blade visible (Qld) . . . . . **9. R. ledifolius**  
 Margins of leaf blades recurved to revolute so that only the midrib of the abaxial surface of the leaf blade is visible . . . . . **6**
6. Fruits < 7 mm long (Qld) . . . . . **4. R. crispatus**  
 Fruits ≥ 7 mm long (N.S.W., Qld) . . . . . **10. R. linearifolius**
7. Adaxial surface of leaf blades hairy becoming glabrous and scabrid by the persistent tuberculate bases of deciduous hairs . . . . . **8**  
 Adaxial surface of leaf blades stellate-pubescent when young becoming glabrous and smooth . . . . . **9**
8. Abaxial surface of leaf blades pubescent with stellate hairs up to 0.4 mm across (N.S.W.) . . . . . **1. R. bowmanii**  
 Abaxial surface of leaf blades sericeous with stellate hairs up to 2 mm across (N.S.W., Qld). . . . . **20. R. trachyphyllus**
9. Leaf blades ≥ 7 mm wide (N.S.W., Qld) . . . . . **19. R. speciosus**  
 Leaf blades < 7 mm wide . . . . . **10**
10. Margins of leaf blades recurved with most of the abaxial surface of the leaf blade visible (Qld) . . . . . **3. R. caniana**  
 Margins of leaf blades recurved to revolute so that only the midrib of the abaxial surface of the leaf blade is visible (N.S.W., Qld). . . . . **10. R. linearifolius**

**Key to species of *Ricinocarpus* in north-western and central Australia**

1. Petals > 5 mm long (N.T.) . . . . . **7. *R. gloria-medii***  
    Petals < 5 mm long . . . . . **2**
2. Leaf blades ≥ 8 mm wide, margins ± flat (W.A.) . . . . . **11. *R. marginatus***  
    Leaf blades < 8 mm wide, margins recurved . . . . . **3**
3. Adaxial surface of leaf blades moderately to densely stellate-pubescent;  
    hairs with short stout stipes (N.T., W.A.) . . . . . **22. *R. trichophyllus***  
    Adaxial surface of leaf blades ± glabrous except for scattered sessile  
    stellate hairs especially along the midline (W.A.) . . . . . **17. *R. rosmarinifolius***

***Ricinocarpus*** Desf. sect. ***Ricinocarpus***, Müll.Arg., *Linnaea* 34: 59 (1865). **Type:** *R. pinifolius* Desf.

*Ricinocarpus* sect. *Bertya* F.Muell., *Fragm.* 1: 76 (1859). **Type:** *Ricinocarpus ledifolius* F.Muell.

*Ricinocarpus* sect. *Euricinocarpus* Müll.Arg., *Linnaea* 34: 59 (1865), *nom. inval.*

Leaves with petiole spreading from branchlet. Inflorescences of a single male or female flower, or ± umbelliform with either all male flowers or one or two central female flowers surrounded by several male flowers. Flowers petaliferous. Stigmatic limbs deeply 2-lobed.

**1. *Ricinocarpus bowmanii*** F.Muell., *Fragm.* 1: 181/182 (1859) (*'Ricinocarpus Bowmanii'*); *Roeperia bowmanii* (F.Muell.) Kuntze, *Revis. Gen. Pl.* 2: 618 (1891); *Ricinocarpus bowmanii* F.Muell. var. *bowmanii*, Maiden & Betche, *Proc. Linn. Soc. New South Wales* 23: 776 (1899). **Type:** [New South Wales.] lower Macquarie River, *s.d.*, *E.M. Bowman s.n.* (holo: MEL 2062913; iso: K [element on the right side of the sheet; element on the left side of sheet is not part of the type collection]).

*Ricinocarpus puberulus* Baill., *Adansonia* 6: 295 (1866). **Type:** [New South Wales.] Port Jackson, *s.d.*, *C.Gaudichaud s.n.* (holo: P 152761).

*Ricinocarpus bowmanii* var. *albus* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 23: 776 (1899) (*'Ricinocarpus Bowmanii* var. *albus'*). **Type:** [New South Wales.] Bomera, Oct 1898, *W.MacDonald s.n.* (holo: NSW [2 sheets 464878, 438911]; iso: BRI [AQ 205160]).

*Ricinocarpus bowmanii* var. *planus* Grüning in A. Engler, *Pflanzenr.* H.58: 43 (1913) (*'Ricinocarpus Bowmanii* var. *plana'*). **Type:** [New South Wales.] "Neusüdwailes: The Rock bei Wagga Wagga, (*Phillips*)" (holo: ?; iso: K, NSW 464908).

*Ricinocarpus bowmanii* var. *genuinus* Grüning in A. Engler, *Pflanzenr.* H.58: 43 (1913) (*'Ricinocarpus Bowmanii* var. *genuina'*), *nom. inval.*

**Illustrations:** James & Harden (1990: pl. 23); Elliot & Jones (2002: 235).

Monoecious or apparently dioecious, spreading **shrubs** to 1 m high, shoot apices and flower buds with ferruginous indumentum. Young branchlets ± terete, with a dense grey-white indumentum, glabrescent though remaining tuberculate by persistent hair bases; hairs stellate, sessile or shortly stipitate, multiangulate, < 0.4 mm across, with stipes < 0.1 mm long. Older branchlets with surface becoming shallowly longitudinally reticulately fissured, ± grey. **Leaves** petiolate, spirally alternate or occasionally subopposite; petioles 1–2 mm long, densely hairy with hairs as for branchlets; blades narrow-oblong to oblong, narrow-obovate, narrow-ovate or rarely linear, (7–) 10–22 (–35) mm long, (1–) 1.5–5 mm wide, with a length/width ratio of 3–15:1; adaxial surface stellate-pubescent but becoming scabrid by the persistent tuberculate bases of deciduous hairs; abaxial surface pubescent with soft white stellate hairs up to 0.4 mm across; base cuneate; margins recurved usually to midrib; apex obtuse; midvein obscure or slightly impressed adaxially, abaxially raised and stellate-pubescent;

secondary venation obscure on both surfaces; marginal glands absent or present on blade, up to 1 mm from base, 1 each side of midrib, stipitate, smooth, *c.* 0.1 mm across; stipes up to 0.4 mm long. **Inflorescences** of a single male or female flower or  $\pm$  umbelliform with either 2–6 male flowers or one central female flower surrounded by up to 4 male flowers, terminal on branchlets; bracts narrow-ovate, 4–8 mm long, glabrous adaxially, stellate-pubescent abaxially; bracteoles narrow-ovate or narrow-oblong, 2–4.5 mm long, glabrous adaxially, stellate-pubescent abaxially. **Flowers** conspicuous; pedicel densely hairy with ferruginous stellate hairs; calyx 5-lobed; petals 5–7, *c.* twice as long as calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 2.5–11 (–23) mm long; calyx densely tomentose with ferruginous and greyish-white stellate hairs abaxially, white stellate-tomentose adaxially, lobes ovate to elliptic, 3–6 mm long, 3–4 mm wide, acute to rounded at the apex; petals broad-ovate or broad-elliptic, 10–13 mm long, 6–10 mm wide, white or pale pink, glabrous, with margins entire, rounded or obtuse at the apex; disc-glands 0.6–0.7 mm long, dorsi-ventrally compressed, glabrous, rounded to truncate at the apex; central column 3–5 mm long, tomentose; stamens 35–60; free portion of filaments 1.3–2.3 mm long, erect to spreading at anthesis, glabrous; anthers *c.* 0.9 mm long. **Female flowers:** pedicel usually stout, 5–9 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes narrow-ovate, 5–6 mm long, 2.5–3 mm wide, acute to obtuse at the apex; petals narrow-obovate to obovate or semi-elliptic, 8.5–12 mm long, 3.5–6 mm wide, white or pale pink, glabrous, with margins entire, rounded at the apex, marcescent; disc-glands as for male flowers; ovary ellipsoid, 2.5–3 mm long, densely stellate-villose with reddish-brown hairs; style *c.* 0.5 mm long, glabrous; stigmatic limbs 3.5–4.5 mm long, glabrous; lobes spreading to  $\pm$  downwardly curving,  $\pm$  dorsi-ventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** ellipsoidal, trilobate, 9–11 mm long, 8–11 mm across, stellate-villose, usually 3-seeded; calyx a quarter to half the length of mature fruit. **Seeds** ovoid or ellipsoid, dorsi-ventrally

compressed, 6.5–7.5 mm long (including caruncle), 3.5–4 mm wide, 3.2–3.4 mm deep; testa dark brown; caruncle  $\pm$  hemispherical, 1–2 mm long, 1.5–2.3 mm wide,  $\pm$  smooth, yellowish-white.

**Additional selected specimens (from 71 examined):** **New South Wales.** Adelong Falls, 1.8 km NNW of Adelong on Tumblong road, Oct 1980, *Coveny 10770 & Hind* (MEL, NSW); Pilliga S.F., 0.4 km W along Burma road from Newell Highway, Aug 1987, *Coveny 12737 et al.* (MEL, PERTH); Pilliga S.F., 0.4 km W along Burma road from Newell Highway, Aug 1987, *Coveny 12742 et al.* (BRI, MEL, PERTH); 98.5 km SW of Narrabri, Oct 1969, *Coveny 2336* (NSW); Pilliga Nature Reserve, No. 1 Break road, 78 km from Narrabri on Newell Highway, Nov 1993, *Forster PIF14197 & Machin* (BRI, NSW); *c.* 36 km NNE of Coonabarabran on Newell Highway to Narrabri, Sep 1989, *Henderson & Turpin H3241* (BRI, NSW); on Newell Highway, *c.* 13 km N of Narrabri, near Telecom C-N12 post, Oct 1990, *Henderson & Turpin H3482* (BRI); Goonoo State Forest, 11 km S of Mendooran, Sep 1989, *Jobson 857 & Lum* (MEL); Bohena Creek, 14 miles [*c.* 22 km] S of Narrabri; E Pilliga S.F., Nov 1954, *Johnson & Constable s.n.* (NSW 30368); 31.3 km N of Oxley Highway intersection on Newell Highway towards Narrabri, Oct 1993, *Johnstone 420b & Burrell* (NSW); 16 km NE of Tumut, Brungle Gap, Honeysuckle Range, Jul 1993, *Makinson 1276 & Butler* (CANB, NSW); 22 km NE of Tumut on the Tumut-Wee Jasper road, Aug 1982, *Norris 809* (MEL, NSW); 10 miles [*c.* 16 km] from Mendooran towards Gilgandra, Oct 1967, *Shoobridge s.n.* (CANB [CBG023519]); Lightning Ridge, Coolac, Sep 1989, *Specht 7* (BRI, NSW); 4 km E of Koorowatha, Sep 1980, *Streimann 8100* (CANB); 61 km from Coonabarabran on Narrabri road [Newell Highway], Dec 1973, *Streimann HS657* (CANB); Kangaroo Mt, near Coolac, Aug 1966, *Whaite & Whaite 3095* (NSW); Pilliga Scrub, Burma road, *c.* 0.5 km from Newell Highway, Aug 1987, *Wiecek 176 et al.* (NSW).

**Distribution and habitat:** *Ricinocarpos bowmanii* occurs on the western slopes and western plains of New South Wales, from Pilliga and Narrabri south to Wagga Wagga and near Tumut (**Map 2**). It is recorded as growing on sandy soils in open eucalypt forest or woodland communities, or on rocky sites on open forested hillsides.

**Phenology:** Flowers have been collected in January, April and from July to November, fruits from September to December.

**Affinities:** *Ricinocarpos bowmanii* is similar to *R. caniana* Halford & R.J.F.Hend., *R. gloria-medii* J.H.Willis, *R. linearifolius* Halford & R.J.F.Hend. and *R. trachyphyllus* Halford & R.J.F.Hend. For features distinguishing



*R. bowmanii* from *R. caniana*, *R. linearifolius* and *R. trachyphyllus*, refer to the 'Affinities' section under the species concerned. *Ricinocarpus bowmanii* can be distinguished from *R. gloria-medii* by its generally shorter leaves that are narrow-oblong to oblong, narrow-obovate, narrow-ovate or rarely linear in outline and the scabrid adaxial surface of the leaf blade.

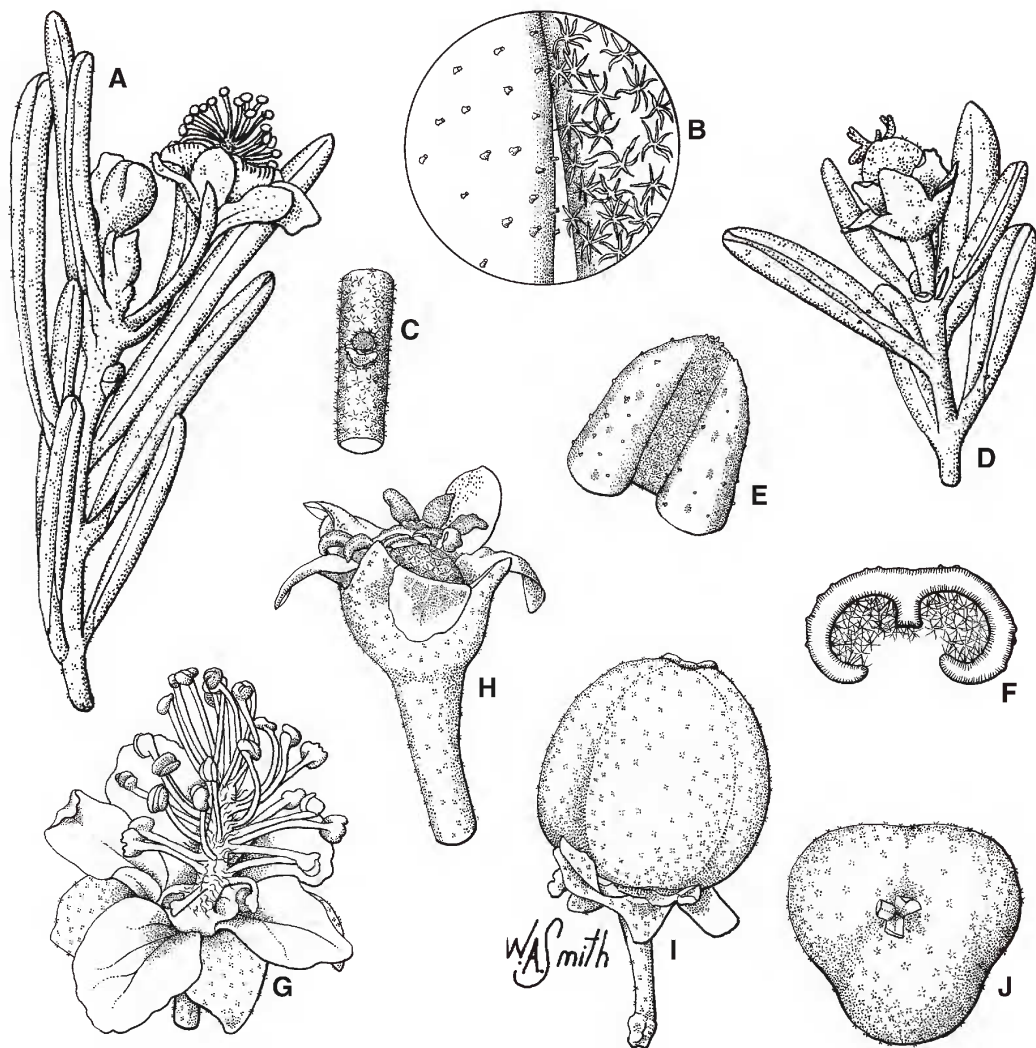
**2. *Ricinocarpus brevis*** R.J.F.Hend. & Mollemans, **species nova** *R. crispato* Halford & R.J.F.Hend. in Terra Reginae austro-occidentali crescentem maxime affinis sed habitu generaliter plus intricato ramoso et fructibus majoribus (8–9 mm longis  $\times$  6–7 mm latis non 4–5 mm longis  $\times$  5–6 mm latis) differt. *R. gloria-medii* J.H.Willis ab Australia centrali nec non affinis sed foliorum lamina brevior (usque ad 30 mm longa non 25–60 mm longa), floribus petalis brevioribus (2.3–5.8 mm longis non 6–11 mm longis), floribus masculis androecii columna brevior (usque ad 3 mm longa non 6–7 mm longa) et staminibus paucioribus (20–30 non 70–80), floribus femineis stigmatum lobis valde brevioribus (0.7–1.5 mm longis non 3–4 mm longis), et fructu minore, 8–9 mm longo et 6–7 mm lato non 10–11 mm longo et 10–11 mm lato differt. Frutex usque ad 1.8 m altus; foliorum lamina angusto-oblonga marginibus plerumque costae revolutis, supra sparsim stellata-pilosa, infra dense stellata-pilosa; flores solitarii vel in fasciculis umbellae formibus florum 2 vel 3 in ramulis terminantibus; ovarium stellatum-pilosum. **Typus:** Western Australia. 7 km N of Windarling Peak, 112 km N of Southern Cross, 23 June 1990, F.H. & M.P. Mollemans 2961 (holo: PERTH; iso: BRI [2 sheets]).

Monoecious or apparently dioecious densely and intricately twiggy **shrubs** 1–1.8 m high. Young branchlets terete, with a dense greyish-white indumentum; hairs stellate,  $\pm$  sessile or shortly stipitate, multiangulate,  $< 0.2$  mm long, with stipes  $< 0.1$  mm long. Older branchlets with surface becoming shallowly longitudinally reticulately fissured,  $\pm$  greyish in colour. **Leaves** petiolate, spirally alternate or occasionally subopposite; petioles 0.9–2 mm long, densely hairy with hairs as for branchlets; blades narrow-oblong, (4–) 7–30 mm long, 1.4–2 (–4) mm across, with

a length/width ratio of 4–12:1; adaxial surface stellate-pubescent but becoming scabrid by the persistent tuberculate bases of deciduous hairs; abaxial surface floccosely hairy below with soft white stellate hairs up to 0.5 mm across; base obtuse to cuneate; margins usually recurved to midrib; apex obtuse; midvein slightly impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands absent or occasionally present on blade, up to 3 mm from blade base, 1 per side of midrib, sessile, smooth, *c.* 0.1 mm across. **Inflorescences** of a single male or female flower, or umbelliform with either two female flowers or one female and one or two male flowers, terminal on branchlets; bracts and bracteoles narrow-ovate, 1.5–2 mm long, glabrous adaxially, stellate-pubescent abaxially, caducous. **Flowers** conspicuous; pedicel densely hairy with mostly white stellate hairs; calyx 5-lobed; petals 5, slightly shorter to a little longer than calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 4–8 mm long; calyx white-woolly stellate hairy abaxially and adaxially, sometimes flecked with red abaxially, lobes ovate to semi-elliptic, 3.8–4.7 mm long, 2–3 mm wide, acute, obtuse or rounded at the apex; petals ovate, 4.3–5.8 mm long, 2.5–3.2 mm wide, white with veins outlined with red colouration, glabrous, with margins few-notched, acute to obtuse at the apex; disc-glands 0.4–0.5 mm long, compressed and truncate-lacerate distally, hairy both adaxially and abaxially with dense, dendritic hairs; central column 2.5–3 mm long, tomentose; stamens 25–45; free portion of filaments 0.8–1.5 mm long, erect to spreading at anthesis, glabrous; anthers *c.* 0.5 mm long. **Female flowers:** pedicel usually stout, 2–5 (–7) mm long; calyx persistent, whitish-grey stellate-pubescent abaxially and adaxially, lobes ovate to semi-elliptic, 3–3.1 mm long, 1.8–2.6 mm wide, acute at the apex; petals elliptic to rhomboidal, 2.3–4.1 mm long, 1.5–1.8 mm wide, white but turning brown, glabrous, with margins entire, acute or obtuse at the apex, marcescent; disc-glands 0.3–0.4 mm long, compressed and  $\pm$  entire but fimbriate distally, hairy adaxially with dense, dendritic hairs, glabrous abaxially; ovary ovoid but 3-sulcate, 3.5–4.2 mm long, densely

loosely stellate-pubescent; style  $\pm$  obsolete; stigmatic limbs 0.7–1.5 mm long, glabrous adaxially, stellate-pubescent proximally abaxially; lobes spreading to  $\pm$  upwardly curving,  $\pm$  dorsi-ventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** ellipsoidal to ovoid, 8–9 mm long, 6–7 mm across, stellate-

pubescent, usually 3-seeded; calyx a quarter to half the length of mature fruit. **Seeds** ovoid, dorsi-ventrally compressed, *c.* 5.5 mm long (including caruncle), 4 mm wide, and 2.7 mm deep; testa pale brown and blotched with dark brown; caruncle  $\pm$  reniform, *c.* 1.5 mm long and 2.2 mm wide,  $\pm$  smooth, yellowish-white. **Fig. 1.**



**Fig. 1.** *Ricinocarpos brevis*. A. branchlet with male flower  $\times 3$ . B. adaxial leaf surface showing indumentum  $\times 36$ . C. branchlet showing stellate indumentum  $\times 6$ . D. branchlet with fruit  $\times 3$ . E. leaf apex  $\times 12$ . F. transverse section of leaf  $\times 12$ . G. side view of male flower  $\times 6$ . H. side view of female flower  $\times 6$ . I. side view of fruit  $\times 4$ . J. face view of fruit  $\times 4$ . A, B, E–H from Mollemans 2961 & Mollemans (BRI); C, D from Mollemans 3087 & Mollemans (BRI); I, J from Mollemans 3773 & Mollemans (BRI). Del. W.Smith.

**Additional specimens examined:** **Western Australia.** Windarling Range, c. 120 km N of Bullfinch, Nov 2001, *Bull s.n.* (PERTH 06334393); 7 km N of Windarling Peak, 112 km N of Southern Cross, Jun 1990, *Mollemans & Mollemans* 2977 (BRI); *loc. cit.*, 11 July 1990, *Mollemans & Mollemans* 3087, 3090, 3091 (BRI); *loc. cit.*, 12 July 1990, *Mollemans & Mollemans* 3094, 3095, 3099 (BRI); *loc. cit.*, Oct 1990, *Mollemans & Mollemans* 3771, 3772, 3773, 3774 (BRI); Windarling Range, Jun 2003, *Vincent 1.1* (PERTH).

**Distribution and habitat:** *Ricinocarpus brevis* is known only from the Windarling Range, north of Southern Cross in Western Australia (**Map 3**). It appears to be confined to a specific habitat, namely shallow sandy soils on rocky banded ironstone outcrops at about 500 to 550 m altitude. At these places, the species occurs in mixed shrublands with *Acacia*, *Grevillea* and/or *Eremophila* species.

**Phenology:** Flowers have been collected in June, July and November, fruits in October and November.

**Affinities:** *Ricinocarpus brevis* is similar to *R. crispatus* Halford & R.J.F.Hend. from south-western Queensland but differs from that in its generally more intricately branched habit and its larger fruits (8–9 mm long  $\times$  6–7 mm across compared with 4–5 mm long  $\times$  5–6 mm across). It is also allied to *R. gloria-medii* J.H.Willis from central Australia but differs from that in its generally shorter leaves (up to 30 mm long compared with 25–60 mm long), its smaller flowers, its shorter petals in both male and female flowers (up to 5 mm long compared with 7–11 mm long), its male flowers with a shorter androecium column (up to 3 mm long compared with 6–7 mm long) and fewer stamens (20–30 compared with 70–80), its female flowers with much shorter stigmatic limbs (up to 1.5 mm long compared with 3–4 mm long), and its smaller fruit (8–9 mm long  $\times$  6–7 mm across compared with 10–11 mm long  $\times$  10–11 mm across).

**Etymology:** The specific epithet, from Latin *brevis* (short) refers to the comparatively short blade and petiole of the leaves and the pedicel of the flowers in this species.

**3. *Ricinocarpus caniana*** Halford & R.J.F.Hend. **species nova** *R. bowmanii* F.Muell. et *R. linearifolio* Halford & R.J.F.Hend. maxime affinis. Ab illo foliis linearibus,

45–100 mm longis non oblongis, angusto-oblongis, angusto-obovatis, angusto-ovatis vel raro linearibus et (7–) 10–22 (–35) mm longis, petiolo longiore (2.5–4 mm longo non 1–2 mm longo), pagina adaxiali plus minusve laevi non scabrida et pagina abaxiali sericea non pubescenti clare differt. Ab hoc foliorum lamina longiore et latiore (45–100 mm longa  $\times$  2–4 mm lata non (8–) 15–45 (–50) mm longa  $\times$  1–1.3 mm lata) et petiolo longiore (2.5–4 mm longo non 0.8–1.5 mm longo) differt.

**Typus:** Queensland. BURNETT DISTRICT: near Dripping Rock, Cania Gorge National Park, 25 October 1999, *D.A.Halford Q3841* (holo: BRI; iso: BRI, MEL, NSW, distribuendi).

*Ricinocarpus* sp. (Cania Gorge K.A.Williams 80221), Forster & Halford (2002: 73; 2007: 72).

**Illustration:** Williams (1987: 340) as *R. ledifolius*.

Monoecious or dioecious, erect **shrubs** to 2 m high, shoot apices and flower buds with ferruginous indumentum. Young branchlets  $\pm$  terete, with a dense greyish-white indumentum; hairs stellate, sessile or shortly stipitate, multiangulate, < 0.5 mm across, with stipes < 0.1 mm long. Older branchlets with surface becoming shallowly longitudinally fissured, pale reddish-brown. **Leaves** petiolate, spirally alternate or occasionally subopposite; petioles 2.5–4 mm long, densely hairy with hairs as for branchlets; blades linear, 45–100 mm long, 2–4 mm wide, with a length/width ratio of 15–45:1; adaxial surface stellate-pubescent when young but soon becoming glabrous and  $\pm$  smooth; abaxial surface sericeous with loosely appressed soft stellate hairs up to 1.5 mm across; base cuneate or truncate; margins slightly recurved in fresh state, recurved to revolute when dried; apex acute and ultimately mucronate with extension from midrib; midvein obscure or slightly impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands present on blade, up to 1 mm from base, 1 each side of midrib,  $\pm$  sessile or shortly stipitate, smooth, c. 0.1 mm across; stipes < 0.1 mm long. **Inflorescences** of a single male or female flower, or umbelliform with either 2–5 male flowers or one (rarely 2) female flowers surrounded by up to 4 male flowers, terminal



on branchlets; bracts linear to lanceolate, 10–11 mm long,  $\pm$  glabrous adaxially, densely stellate-pubescent abaxially, readily caducous; bracteoles lanceolate, 5–7 mm long, glabrous abaxially, sparsely stellate-pubescent adaxially, caducous. **Flowers** conspicuous; pedicel tomentose with ferruginous and greyish-white stellate hairs; calyx 5-lobed; petals 5, slightly longer than calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 9–17 mm long; calyx densely tomentose with ferruginous and greyish-white stellate hairs abaxially, white stellate-tomentose adaxially, lobes ovate to elliptic, 4.3–5.8 mm long, 2.2–3 mm wide, acute at the apex; petals ovate, c. 9 mm long and 4.7 mm wide, white, glabrous, with margins entire, rounded or obtuse at the apex; disc-glands 0.5–0.6 mm long, dorsi-ventrally compressed, glabrous, rounded to truncate at the apex; central column c. 4 mm long, tomentose; stamens c. 50; free portion of filaments 2–2.5 mm long, erect to spreading or decurving at anthesis, glabrous; anthers 0.4–0.6 mm long. **Female flowers:** pedicel stout, 7–14 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes ovate, 4.5–5 mm long, 2.2–3 mm wide, acute at the apex; petals obovate, 7–7.5 mm long, 3–3.5 mm wide, white, glabrous, with margins entire, obtuse to rounded at the apex, marcescent; disc-glands as for male flowers; ovary subglobose, 3-sulcate, c. 3.8 mm long, densely stellate-villose; style c. 0.3 mm long, stellate-pubescent; stigmatic limbs c. 2 mm long, glabrous adaxially, scattered stellate hairs proximally abaxially; lobes  $\pm$  spreading,  $\pm$  dorsi-ventrally compressed but shallowly grooved abaxially, smooth on both surfaces. **Fruits** subglobose, trilobate, 10–11 mm long, 10–11 mm across, stellate-villose, usually 3-seeded; calyx  $\pm$  half the length of mature fruit. **Seeds** ovoid, dorsi-ventrally compressed, c. 6.3 mm long (including caruncle), 3 mm wide and 2.6 mm deep; testa dark red-brown; caruncle  $\pm$  hemispherical, c. 1 mm long and 1.3 mm wide,  $\pm$  smooth, white. **Fig. 2.**

**Additional specimens examined:** Queensland. BURNETT DISTRICT: c. 19 km NW of Monto at Cania Gorge, Aug 1982, *Anderson 3170* (BRI); Cania Gorge N.P., Oct 1983, *Henderson H2943 et al.* (BRI); Dripping Rock, Cania Gorge N.P., c. 24 km NW of Monto, Oct 1987, *Henderson H3105* (BRI); Cania Gorge, Aug 1996, *Telford 12319, 12320* (BRI); Cania Gorge, near Dripping Rock, Aug 1980, *Williams 80221* (BRI).

**Distribution and habitat:** *Ricinocarpus caniana* is known only from Cania Gorge near Monto in south-eastern Queensland (**Map 4**). It is recorded as growing in open *Eucalyptus*, *Lophostemon* forest with a dense shrubby understorey on shallow sandy soils between sandstone rocks on steep talus slope in a narrow gorge.

**Phenology:** Flowers have been collected in August, fruits in October.

**Affinities:** *Ricinocarpus caniana* is similar to *R. bowmanii* and *R. linearifolius*. It is easily distinguished from *R. bowmanii* by its linear leaf blades which are 45–100 mm long as compared with oblong to narrow-oblong, narrow-obovate, narrow-ovate or rarely linear leaf blades which are (7–) 10–22 (–35) mm long in that species, its longer petioles which are 2.5–4 mm long compared with 1–2 mm long in that species, its  $\pm$  smooth rather than scabrid adaxial surface of the leaf blades and its sericeous rather than pubescent indumentum on the abaxial surface of the leaf blades. It differs from *R. linearifolius* by its generally longer and broader leaf blades (45–100 mm long  $\times$  2–4 mm wide compared with (8–) 15–45 (–50) mm long  $\times$  1–1.3 mm wide in that species), and its longer petioles which are 2.5–4 mm long compared with 0.8–1.5 mm long in the latter species.

**Etymology:** The specific epithet *caniana* is derived from Cania Gorge, the area in south-eastern Queensland where this species occurs.

**4. *Ricinocarpus crispatus*** Halford & R.J.F.Hend. **species nova** *R. brevis* R.J.F.Hend. & Mollemans a Australia Occidentali australi maxime affinis etiam *R. gloria-medii* J.H.Willis ab Australia centrali affinis. Ab illo habitu minore intricate ramoso et fructibus minoribus (4–5 mm longis  $\times$  5–6 mm latis non 8–9 mm longis  $\times$  6–7 mm latis) differt. Ab hoc foliis plerumque brevioribus (15–25 (–35) mm longis non 25–60 mm longis), floribus minoribus sepalis et petalis brevioribus in floribus masculinis et femineis (sepala 3–4 mm longa non 4.5–8 mm longa et petala 3.8–5 mm longa non 7–11 mm longa), floribus masculinis androecii columnae brevioris (2.5–3 mm longa non 6–7 mm



**Fig. 2.** *Ricinocarpos caniana*. A. flowering branchlet  $\times 0.8$ . B. adaxial leaf surface showing indumentum  $\times 2$ . C. transverse section of leaf  $\times 16$ . D. stellate hair, from abaxial leaf surface  $\times 32$ . E. side view of male flower  $\times 3$ . F. side view of female flower  $\times 3$ . G. side view of fruit  $\times 2$ . H. face view of fruit  $\times 2$ . I. ventral view of seed  $\times 6$ . J. side view of seed  $\times 6$ . A, E from Telford 12320 (BRI); B–D, G, H from Henderson H3105 (BRI); F from Telford 12319 (BRI); I, J from Halford Q3841 (BRI). Del. W. Smith.



longa) et staminibus paucioribus (20–30 non 70–80), floribus femineis stigmatis limbis multo brevioribus (1–1.5 mm longis non 3–4 mm longis) et fructibus minoribus (4–5 mm longis  $\times$  5–6 mm latis non 10–11 mm longis  $\times$  10–11 mm latis) differt. **Typus:** Queensland. WARREGO DISTRICT: Mariala National Park, c. 130 km NW of Charleville, 31 July 1991, *R.J.F. Henderson & G. Turpin H3538* (holo: BRI; iso: CANB, DNA, MEL, NSW, PERTH, distribuendi).

*Ricinocarpus* sp. (Mt Calder Station M.E. Ballingall MEB1588), Forster & Halford (2002: 73; 2007: 72).

Monoecious or dioecious **shrubs** to 2 (–3.5) m high. Young branchlets terete, with a dense greyish-white indumentum; hairs stellate, sessile or shortly stipitate, multiangulate, < 0.2 mm across, with stipes < 0.1 mm long. Older branchlets with surface becoming shallowly fissured,  $\pm$  dark grey. **Leaves** petiolate, spirally alternate or occasionally subopposite; petioles 1.2–3 mm long, densely hairy with hairs as for branchlets; blades linear, 15–25 (–35) mm long, 1–2 mm wide, with a length/width ratio of 9–16 (–20):1; adaxial surface stellate-pubescent but becoming glabrous and smooth or scabrid by the persistent tuberculate bases of deciduous hairs; abaxial surface floccosely hairy with soft white stellate hairs up to 0.2 mm across; base cuneate; margins recurved to revolute to midrib; apex obtuse to rounded, gland-tipped; midvein slightly impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands absent or occasionally present on blade, up to 1 mm from base, 1 per side of midrib, sessile, smooth, c. 0.1 mm across. **Inflorescences** of a single male or female flower, or umbelliform with either 2–4 male flowers or one female flower surrounded by up to 2 male flowers, terminal on branchlets; bracts and bracteoles linear, 2–2.5 (–4) mm long, glabrous adaxially, densely stellate-pubescent abaxially, readily caducous. **Flowers**  $\pm$  inconspicuous; pedicel densely hairy with mostly greyish-white stellate hairs; calyx 5-lobed; petals 5, slightly longer than calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 3–14 mm long; calyx densely pubescent with greyish-white stellate hairs

abaxially; white stellate-pubescent adaxially, lobes ovate, 3–4 mm long, 1.8–2.3 mm wide, acute or obtuse at the apex; petals obovate, 4–5 mm long, 2.3–2.6 mm wide, white, glabrous, with margins crispate, rounded at the apex; disc-glands 0.4–0.5 mm long, dorsi-ventrally compressed, stellate-pubescent distally adaxially,  $\pm$  glabrous abaxially, rounded at the apex; central column 2.5–3 mm long, tomentose; stamens 20–30; free portion of filaments 0.5–0.8 mm long, erect to spreading at anthesis, glabrous; anthers c. 0.4 mm long. **Female flowers:** pedicel stout, 3–12 (–16) mm long; calyx persistent, indumentum as for calyx of male flowers, lobes 3.4–4 mm long, 1.8–2.1 mm wide, acute to obtuse at the apex; petals obovate, 3.8–4.1 mm long, 1.8–2.2 mm wide, white, glabrous, with margins crispate, obtuse to rounded at the apex, marcescent; disc-glands as for male flowers; ovary ovoid but 3-sulcate, c. 2.3 mm long, densely loosely stellate-pubescent; style  $\pm$  obsolete; stigmatic limbs 1–1.5 mm long, glabrous adaxially, stellate-pubescent proximally abaxially; lobes spreading to  $\pm$  upwardly curving, keeled and verrucose adaxially, flat and smooth abaxially. **Fruits** depressed globose, trilobate, 4.5–5 mm long, 5–6 mm across, stellate-pubescent, usually 3-seeded; calyx c. half the length of mature fruit. **Seeds** ovoid, dorsi-ventrally compressed, c. 4.2 mm long (including caruncle), 2.7 mm wide and 2.2 mm deep; testa dark red-brown; caruncle  $\pm$  reniform, c. 0.4 mm long and 1.8 mm wide,  $\pm$  smooth, yellowish-white. **Fig. 3.**

**Additional specimens examined:** Queensland. MITCHELL DISTRICT: Idalia N.P., Dec 1993, *Addicott 3* (BRI); Mt Calder Station, Blackall–Adavale road, Sep 1984, *Ballingall 1588* (BRI); c. 4 km W of Tomahawk Hut, Mt Calder Station, Aug 1991, *Henderson & Turpin H3540* (BRI). WARREGO DISTRICT: W of ‘One Stone Hill’ on Lisburne Station between Blackall and Adavale, Grey Range, Jul 1989, *Allen 12* (BRI); Mariala N.P. on Adavale road, 7.1 km W of earth Tank, Apr 1995, *Ballingall 2738* (BRI); c. 12 km directly SW of Mt Calder Station homestead, Aug 1991, *Henderson & Turpin H3542* (BRI); ‘Lisburne’, 108 km NE of Adavale, Dec 1984, *McRae 3* (BRI); 1 km E of Idalia N.P. headquarters, 113 km SW of Blackall, May 2000, *Nicholls SN181* (BRI); Ambathala Range area, 50 km E of Adavale, May 1979, *Sandercoe 191* (BRI).

**Distribution and habitat:** *Ricinocarpus crispatus* is confined to south-western Queensland where it occurs in scattered



**Fig. 3.** *Ricinocarpos crispatus*. A. flowering branchlet  $\times 2$ . B. adaxial leaf surface  $\times 4$ . C. transverse section of leaf  $\times 18$ . D. side view of male flower  $\times 6$ . E. side view of female flower  $\times 6$ . F. face view of female flower  $\times 8$ . G. adaxial view of petal  $\times 12$ . H. side view of fruit  $\times 4$ . I. face view of fruit  $\times 4$ . J. ventral view of seed  $\times 8$ . K. side view of seed  $\times 8$ . A–C from Henderson & Turpin H3538 (BRI); D from Henderson & Turpin H3540 (BRI); E–K from Ballingall 1588 (BRI). Del. W.Smith.

populations in an area more or less bounded by Blackall, Quilpie and Charleville (**Map 5**). It is recorded growing as a component of shrubland communities commonly dominated by *Acacia catenulata* on red clay soils, with outcropping rocks on slopes and crests of low isolated dissected tablelands.

**Phenology:** Flowers have been collected in August and December, fruits in May and September.

**Affinities:** *Ricinocarpus crispatus* is similar to *R. brevis* R.J.F.Hend. & Mollemans from southern Western Australia but is also allied to *R. gloria-medii* J.H.Willis from central Australia. It differs from the former by its less intricately branched habit and its smaller fruits which are 4–5 mm long  $\times$  5–6 mm across compared with 8–9 mm long  $\times$  6–7 mm across in *R. brevis*. From the latter, it differs in its generally shorter leaves which are 15–25 (–35) mm long compared with 25–60 mm long, its smaller male and female flowers which both have shorter sepals and petals (sepals which are 3–4 mm long compared with 4.5–8 mm long and petals which are 3.8–5 mm long compared with 7–11 mm long), its male flowers with a shorter androecium column and fewer stamens (the androecium column is 2.5–3 mm long compared with 6–7 mm long, and the stamens number 20–30 compared with 70–80), its female flowers with much shorter stigmatic limbs which are 1–1.5 mm long compared with 3–4 mm long, and its smaller fruit which are 4–5 mm long  $\times$  5–6 mm across compared with 10–11 mm long  $\times$  10–11 mm across in *R. gloria-medii*.

**Etymology:** The specific epithet is from Latin *crispatus* (irregularly waved and twisted), in reference to the wavy margins of petals in both male and female flowers of this species.

**5. *Ricinocarpus cyanescens*** Müll.Arg., *Linnaea* 34: 60 (1865) ('*Ricinocarpus*'); *Ricinocarpus glaucus* var. *cyanescens* (Müll.Arg.) Baill., *Adansonia* 6: 296 (1866); *Roeperia cyanescens* (Müll.Arg.) Kuntze, *Revis. Gen. Pl.* 2: 618 (1891). **Type:** [Western Australia.] in Nova Hollandia austro-occidentali ad Swan River, *s.d.*, *J.Drummond ser. 3 no. 15* (syn: ?, *n.v.*; isosyn: K, MEL 2062915, P 199397); *loc. cit.*, *ser. 3 no. 86 p.p.* (syn: ?, *n.v.*).

Monoecious, compact **shrubs** to 2 m high. Young branchlets subterete, glabrous,  $\pm$  glaucous. Older branchlets with surface becoming tessellated and flaky, pale brown or greyish in colour. **Leaves** petiolate, spirally alternate; petioles 1–2 mm long, glabrous; blades narrow-oblong, 7–12 mm long, 1–1.7 mm wide, with a length/width ratio of 5–8:1; adaxial surface glabrous,  $\pm$  smooth; abaxial surface puberulous with soft white crispate hairs up to 0.2 mm long; base cuneate; margins recurved to midrib so that only midrib of abaxial surface of leaf blade is visible; apex obtuse to rounded, ultimately mucronate with extension from midrib; mucro slightly downwardly curved, up to 0.3 mm long; midvein obscure adaxially, abaxially raised and glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** of a single male or female flower, or  $\pm$  umbelliform with either 2–4 male flowers or one female flower surrounded by up to 2 male flowers, terminal on branchlets; bracts narrow-ovate, 4–8 mm long, glabrous adaxially, stellate-pubescent abaxially, caducous; bracteoles absent. **Flowers** conspicuous; pedicel glabrous; calyx 5-lobed; petals 5, *c.* twice as long as calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 5–16 mm long; calyx glabrous abaxially, densely hairy with white crispate hairs adaxially, lobes triangular, 1.5–2 mm long, 1–1.5 mm wide, acute at the apex; petals narrow-obovate, 6–11 mm long, 2–3 mm wide, white, glabrous except for tuft of white simple hairs proximally on adaxial surface, with margins entire, obtuse to rounded at the apex; disc-glands 0.2–0.3 mm long, dorsiventrally compressed, glabrous, rounded-sinuate at apex; central column 2.5–3 mm long, glabrous; stamens 20–30; free portion of filaments 0.3–0.6 mm long,  $\pm$  erect at anthesis, glabrous; anthers *c.* 0.5 mm long. **Female flowers:** pedicel usually stout, 3–10 mm long; calyx caducous, indumentum as for calyx of male flowers, lobes  $\pm$  triangular, 2–2.5 mm long, 1.4–1.8 mm wide, acute at the apex; petals narrow-obovate, 6–7 mm long, 2–2.5 mm wide, white, glabrous except for tuft of white simple hairs proximally on adaxial surface, with margins entire, obtuse or rounded at the apex, caducous; disc-glands



as for male flowers; ovary ovoid, *c.* 3 mm long, glabrous, verrucose; style  $\pm$  obsolete; stigmatic limbs of unknown colour when fresh, 1.5–1.7 mm long, glabrous; lobes spreading to  $\pm$  downwardly curving,  $\pm$  dorsi-ventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** ellipsoidal, 10–11 mm long, 5–6 mm across, glabrous, verrucose, usually 1-seeded. **Seeds** ovoid, dorsi-ventrally compressed, *c.* 7.3 mm long (including caruncle), 4 mm wide and 3.5 mm deep; testa pale brown and blotched with dark brown; caruncle  $\pm$  concial, *c.* 1.7 mm long and 2 mm wide,  $\pm$  smooth, yellowish-white.

**Additional specimens examined:** **Western Australia.** Mt Hamilla, Stirling Range, Oct 1968, *Canning WA/68 6154* (CANB, MEL); 35 km S of Arthur River, Oct 1983, *Cranfield 4679* (CANB); 4.5 km NE of Metricup, May 1996, *Davis 630* (CANB); Donnelly Peak, Stirling Range, Nov 1934, *Gardner s.n.* (PERTH); near Boscabel turnoff, on Albany Highway, Dec 1966, *Lullfitz 5835* (PERTH); Toolbrunup, Stirling Range, Nov 1935, *Steedman s.n.* (PERTH); 10 km W of Kojonup, Nov 1978, *Wittwer W2238* (PERTH).

**Distribution and habitat:** *Ricinocarpos cyanescens* is confined to south-western Western Australia where it occurs from near Metricup, Arthur River, Boscabel, Kojinup, Cranbrook and the Stirling Ranges (**Map 6**). This poorly collected species is recorded as growing on mostly sandy soils in open forest or woodland.

**Phenology:** Flowers have been collected from October to December, fruits in October.

**Affinities:** *Ricinocarpos cyanescens* is similar to *R. tuberculatus* Müll. Arg. but differs from that in having generally shorter leaves, 1-seeded fruits and a verrucose fruit surface.

**6. *Ricinocarpos glaucus*** Endl. in S.F.L. Endlicher *et al.*, *Enum. Pl.* 18/19 (1837) ('*Ricinocarpus*'); *Ricinocarpos glaucus* Endl. var. *glaucus*, Baill., *Adansonia* 6: 296 (1866); *Roeperia glauca* (Endl.) Kuntze, *Revis. Gen. Pl.* 2: 618 (1891). **Type:** [Western Australia.] King Georges Sound, *s.d.*, [*K.A.A.*] *Hügel s.n.* (holo: W, *n.v.* [photo BRI]).

*Ricinocarpos glaucus* var. *jasminoides* Baill., *Adansonia* 6: 296 (1866). **Type:** [Western Australia.] Plantagenet and Stirling Range, *s.d.*, [without collector] (neo [here chosen]: MEL 2062912).

*Ricinocarpos glaucus* var. *genuinus* Müll. Arg. in A. DC., *Prodr.* 15(2): 205 (1866), *nom. inval.*

**Illustration:** Elliot & Jones (2002: 235).

Monoecious or dioecious, erect open **shrubs** to 2 m high. Young branchlets subterete, moderately to densely hairy in two longitudinal bands; hairs simple, erect, up to 0.2 mm long. Older branchlets with surface becoming shallowly longitudinally fissured, greyish-white. **Leaves** petiolate, spirally alternate or occasionally subopposite; petioles 1–2 mm long, densely hairy adaxially with  $\pm$  appressed simple hairs up to 0.4 mm long, glabrous abaxially; blades linear to narrow-oblong, (7–) 10–40 mm long, 0.8–2 mm wide, with a length/width ratio of 8–33:1; adaxial surface glabrous, smooth; abaxial surface woolly with soft white crispate hairs up to 1.2 mm long; base cuneate; margins recurved usually to midrib; apex acute and ultimately mucronate with extension from midrib; mucro straight or slightly upwardly curved, up to 0.4 mm long; midvein slightly impressed adaxially, abaxially raised and glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** of a single male or female flower, or  $\pm$  umbelliform with either 2–4 male flowers or one female flower surrounded by up to 3 male flowers, terminal on branchlets or sometimes appearing axillary due to reduction of lateral branchlet; bracts narrow-ovate, 2–3 mm long, stellate-pubescent on adaxial surface and margins, glabrous abaxially; bracteoles sometimes absent, when present narrow-ovate, 1.5–2 mm long, stellate-pubescent adaxially, glabrous abaxially. **Flowers** conspicuous; pedicel  $\pm$  glabrous; calyx 5-lobed; petals 5, up to three times as long as calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 7–25 mm long; calyx glabrous abaxially, densely hairy with white crispate hairs adaxially, lobes triangular or rarely ovate, 1.5–3 mm long, (0.7–) 1–2 (–3) mm wide, acute at the apex; petals narrow-oblong or narrow-obovate, (4–) 5–12 mm long, 1.5–2.7 mm wide, white, glabrous except for tuft of white simple hairs proximally on adaxial surface, with margins entire, rounded or obtuse at the apex; disc-glands 0.5–0.7

mm long, dorsio-ventrally compressed, hairy adaxially with  $\pm$  erect simple hairs,  $\pm$  glabrous abaxially, rounded or truncate-sinuate at apex; central column 2.5–3 mm long, glabrous; stamens 20–35; free portion of filaments 0.5–1.3 mm long, erect to spreading at anthesis, glabrous; anthers 0.4–0.7 mm long. **Female flowers:** pedicel stout, 7–20 (–40) mm long; calyx persistent, indumentum as for calyx of male flowers, lobes triangular, 1.5–2 mm long, 0.7–1 mm wide, acute at the apex; petals narrow-oblong or narrow-obovate, 7–10 mm long, 1.6–2 mm wide, white, glabrous except for scattered simple hairs proximally on adaxial surface, with margins entire, obtuse at the apex, caducous; disc-glands as for male flowers; ovary ovoid but 3-sulcate, 1.6–2.3 mm long, glabrous, smooth; style *c.* 0.3 mm long, glabrous; stigmatic limbs 0.3–1.3 mm long, glabrous; lobes spreading to ascending,  $\pm$  terete,  $\pm$  smooth. **Fruits** oblong in outline, strongly trilobate, 6.5–8 mm long, 4.5–6.5 mm across, glabrous,  $\pm$  smooth, usually 3-seeded; calyx *c.* a fifth the length of mature fruit. **Seeds** obloid, *c.* 6.5 mm long (including caruncle), 2.7 mm wide and 2.2 mm deep; testa pale brown and blotched with dark brown; caruncle  $\pm$  hemispherical, *c.* 1 mm long and 1.8 mm wide,  $\pm$  smooth, yellowish-white.

**Additional selected specimens (from 39 examined):** **Western Australia.** Porongorup Range, Oct 1962, *Aplin 2162* (PERTH); Shannon Mill, Nornalup–Manjinup, Oct 1967, *Ashby 2371* (PERTH); Castle Rock in Nornalup N.P., near Walpole, Oct 1967, *Belcher & Belcher 346* (MEL, PERTH); Mt Frankland, W of Albany, Sep 1966, *Bennett 1167* (PERTH); 4 miles [6.6 km] W of Denmark, Manjimup road, Oct 1962, *Fairall 618* (PERTH); Davidson road, Barlee Brook crossing, 35 km WNW [of] Manjimup PO (Post Office), Oct 1982, *Forbes 1160* (MEL, PERTH); Mt Frankland road, *c.* 22 km N of Walpole, 5 km E of Thompsons road, Dec 1985, *Foreman 1496* (MEL, PERTH); 5 km ENE of junction of Broke Inlet road and Chesapeake road, NW of Walpole, Oct 1988, *Fox 88/309* (CANB, MEL); Margaret River, Oct 1940, *Gardner 5598* (PERTH); Cape Riche, Oct 1928, *Gardner 2155* (PERTH); N of Walpole, Oct 1955, *Gauba WA1089* (CANB); Woodlands road, Porongorup Range, 35 km NNE [of] Albany, Oct 1986, *Keighery 8468* (PERTH); Boulder Hill, Betty's Beach, 32 km E of Albany, Jul 1986, *Keighery 8266* (PERTH); Albany, King George Sound, *s.d.*, *Lea s.n.* (PERTH); *c.* 9 km direct NNW of Albany at Willyung Hill, Nov 1992, *Lyne 968 et al.* (BRI, MEL); Mt Clare, Walpole, Nov 1969, *Mann & George 91* (PERTH); Devils Slide, Porongorup Range, Oct 1963, *Rogerson 38* (PERTH); South Porongorup Range, 1.5 km SW of Nancy Peak, Nov 1989, *Spencer*

*297 & Walsh* (MEL); 7 km W of Walpole, Oct 1967, *Wilson 6319* (CANB, PERTH); 7 km W of Walpole, Oct 1967, *Wilson 6320* (CANB, MEL, PERTH).

**Distribution and habitat:** *Ricinocarpus glaucus* is confined to south-western Western Australia where it occurs from near Margaret River eastwards to Cape Riche east of Albany (Map 7). It is recorded as growing in a variety of habitats: gently undulating terrain on orange sandy clay in tall forest with karri and red tingle; sandstone hills; on top of a rocky granite rise in low mallee heath community; loam over granite in jarrah woodland; loamy lateritic soil in grassy heathland; on hilltop on coarse sandy loam over clay in jarrah mallee.

**Phenology:** Flowers have been collected from June to December, fruits from September to December.

**Affinities:** *Ricinocarpus glaucus* is similar to *R. pilifer* Halford & R.J.F.Hend and *R. undulatus* Lehm. For features distinguishing *R. glaucus* from *R. pilifer* refer to the 'Affinities' section under that species. It differs from *R. undulatus* in having a woolly indumentum with crispate hairs on the abaxial surface of leaf blades and white petals.

**Typification:** In the protologue of *Ricinocarpus glaucus* var. *jasminoides*, Baillon (1866) cited "F. Mueller, Plantagenet et Stirling Range (herb.)". A request for material from P and MEL revealed a single specimen at MEL [2062912] with a blue label that has in a single hand "*Ricinocarpus glaucus* Endl. Plantagenet & Stirling Range". This label has been annotated in another unknown hand with "(jasminoides)". We have been unable to confirm whether this is at least part of the material sent to Baillon or even whether it is part of the original material. We have therefore nominated it as the neotype. The specimen agrees with the brief description in Baillon's protologue of *Ricinocarpus glaucus* var. *jasminoides*.

**7. *Ricinocarpus gloria-medii*** J.H.Willis, *Muelleria* 3: 95, t.5, 6 (1975). **Type:** [Northern Territory] Simpsons Gap, Macdonnell Ranges, 19 June 1972, *H.A. Morrison s.n.* (holo: MEL 501448; iso: AD, DNA).



**Illustration:** Willis (1975: pl. 5 and pl. 6 *pro parte*).

Monoecious or dioecious, spreading, twiggy **shrubs** to 2 m high, shoot apices and flower buds with ferruginous indumentum. Young branchlets terete, with a dense grey-white indumentum; hairs stellate, sessile or shortly stipitate, multiangulate, < 0.3 mm across, with stipes < 0.1 mm long. Older branchlets with surface becoming shallowly, longitudinally, reticulately fissured,  $\pm$  grey. **Leaves** petiolate, spirally alternate or occasionally subopposite; petioles 2–3 mm long, densely hairy with hairs as for branchlets; blades linear or very narrow-obovate, 25–60 mm long, 1.3–3.5 mm wide; with a length/width ratio of 20–40:1; adaxial surface stellate-pubescent, somewhat glabrescent, smooth; abaxial surface tomentose with soft white stellate hairs up to 0.8 mm across; base cuneate; margins recurved often to midrib; apex obtuse; midvein slightly impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands absent or present on blade, up to 30 mm from base, 1 each side of midrib, sessile, smooth, c. 0.2 mm across. **Inflorescences** of a single male or female flower, or  $\pm$  umbelliform with either 2–4 male flowers or one central female flower surrounded by up to 4 male flowers, terminal on branchlets; bracts and bracteoles linear-oblong, 1–6 mm long, stellate-pubescent adaxially and abaxially. **Flowers** conspicuous; pedicel densely hairy with greyish-white and ferruginous stellate hairs; calyx 5-lobed; petals 5, equalling or slightly longer than calyx; disc a glandular ring. **Male flowers:** pedicel slender, 7–17 mm long; calyx densely tomentose with greyish-white and ferruginous stellate hairs abaxially and adaxially, lobes ovate, 4.5–7 mm long, 3–4 mm wide, acute to obtuse at the apex; petals obovate, 7–11 mm long, 3–5 mm wide, white or cream, glabrous, with margins few-notched and undulate, obtuse to rounded at the apex; disc c. 0.3 mm long, dorsi-ventrally compressed, densely stellate-pubescent adaxially,  $\pm$  glabrous abaxially, truncate-sinuate distally; central column 6–7 mm long, sparsely stellate-pubescent; stamens 70–80; free portion of filaments 1.5–2 mm long,

erect at anthesis, glabrous; anthers c. 0.8 mm long. **Female flowers:** pedicel stout, 10–15 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes ovate, 6.5–8 mm long, 3–4 mm wide, acute at the apex; petals obovate, 6–8 mm long, 3–4 mm wide, white or cream, glabrous, with margins entire, obtuse to rounded at the apex, marcescent; disc as for male flowers; ovary subglobose, c. 3 mm long, densely loosely stellate-pubescent; style  $\pm$  obsolete; stigmatic limbs 3–5 mm long, glabrous adaxially, stellate-pubescent proximally abaxially; lobes spreading to  $\pm$  upwardly curving,  $\pm$  dorsi-ventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** subglobose, 10–11 mm long, 10–11 mm across, stellate-pubescent, usually 3-seeded; calyx  $\pm$  equal to the length of mature fruit. **Seeds** ovoid, dorsi-ventrally compressed, c. 6.5 mm long (including caruncle), 4 mm wide and 3 mm deep; testa pale brown; caruncle  $\pm$  hemispherical, c. 1 mm long and 1.3 mm wide,  $\pm$  wrinkled, yellowish-white.

**Selected specimens (from 9 examined):** Northern Territory, Simpsons Gap N.P., Jun 1974, *Henshall 462* (BRI, MEL, NSW, PERTH); Simpsons Gap N.P., Jun 1974, *Henshall 461* (BRI, MEL, NSW, PERTH); 4 km W of Trephina Gorge, Jul 1983, *Latz 9588* (NSW); N'Dhala Gorge, Oct 1986, *Leach 938* (BRI); N'Dhala Gorge Scenic Reserve, Aug 1987, *Meredith et al. ANBG1858* (CANB); Simpsons Gap, Macdonnell Ranges, Jun 1972, *Morrison s.n.* (BRI [AQ198263], PERTH); Simpsons Gap, Macdonnell Ranges, Jun 1974, *Willis et al. s.n.* (BRI [AQ198264], PERTH).

**Distribution and habitat:** *Ricinocarpus gloria-medii* is confined to the Macdonnell Ranges, Northern Territory, where it is known from Trephina Gorge, Simpsons Gap and N'Dhala Gorge (**Map 8**). It is recorded as growing in sheltered areas such as dry watercourses and at cliff bases on steep slopes of quartzite and sandstone hills.

**Phenology:** Flowers have been collected in June and July, fruits in October.

**Affinities:** *Ricinocarpus gloria-medii* is similar to *R. bowmanii*, *R. brevis* and *R. crispatus*. For features distinguishing *R. gloria-medii* from *R. brevis* and *R. crispatus*, refer to the 'Affinities' section under the species concerned. *Ricinocarpus gloria-medii* can be distinguished from

*R. bowmanii* by its generally longer leaves that are linear or very narrow-obovate in outline and the smooth adaxial surface of the leaf blades.

**8. *Ricinocarpus graniticus*** Halford & R.J.F.Hend. **species nova** *R. psiloclado* (Müll. Arg.) Benth., similiter ab Australia Occidentali australi-occidentali, maxime affinis sed foliorum lamina angustiore (1.2–1.5 mm lata non (1.5–) 2.5–7 mm lata) pagina adaxiali laevi non tuberculata et marginibus recurvatis vel revolutis ad costam paginam abaxialem occultantibus praeter costam non tantum plus minusve recurvatis differt. **Typus:** Western Australia. Herne Hill, Darling Range, 27 September 2004, *P.I. Forster PIF30387* (holo: PERTH; iso: BRI, MEL, NSW).

Monoecious **shrubs** up to 2 m high, resinous on shoots and inflorescences. Young branchlets  $\pm$  angular, longitudinally striate in dried state, glabrous. Older branchlets with surface becoming tessellated,  $\pm$  grey. **Leaves** mostly crowded towards the ends of short lateral branchlets, petiolate, spirally alternate; petioles 1–2 mm long, glabrous; blades linear, 15–40 mm long, 1.2–1.5 mm wide, with a length/width ratio of 10–17:1; adaxial surface glabrous and smooth; abaxial surface tomentose with shortly stipitate white stellate hairs up to 0.7 mm across; base cuneate; margins recurved to revolute to midrib so that only midrib of abaxial surface of leaf blade is visible; apex obtuse to rounded, ultimately gland-tipped with short mucro from midrib; midvein impressed adaxially, abaxially raised, glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent or present on blade, up to 1 mm from base, 1 each side of midrib, sessile, smooth, *c.* 0.1 mm across. **Inflorescences** of a single male or female flower, or  $\pm$  umbelliform with one female flower surrounded by up to 2 male flowers, terminal on branchlets or sometimes appearing axillary due to reduction of lateral branchlet; bracts and bracteoles oblong, 1–2 mm long, glabrous, resinous, caducous. **Flowers** conspicuous; pedicel glabrous; calyx 5-lobed; petals 5, *c.* twice as long as calyx. **Male flowers:** pedicel slender, 6–9 mm long; calyx glabrous abaxially and adaxially, sometimes with scattered minute

stellate hairs on margins, resinous abaxially, lobes ovate, 4–4.2 mm long, 2.5–2.6 mm wide, obtuse to rounded at the apex; petals lanceolate or oblong, 6–8 mm long, 1.5–2.4 mm wide, creamy-white, glabrous, with margins entire, rounded to obtuse at the apex; disc a glandular ring, dorsi-ventrally compressed, *c.* 0.3 mm long, glabrous, sinuate, irregularly lobed distally; central column *c.* 3 mm long, glabrous; stamens *c.* 35; free portion of filaments 1–1.5 mm long,  $\pm$  erect at anthesis, glabrous; anthers *c.* 0.5 mm long. **Female flowers** not seen; pedicel stout, 5–10 mm long in fruit. **Fruits** ellipsoid, trilobate, *c.* 7 mm long and 6.5 mm across, glabrous,  $\pm$  smooth, 3-seeded; calyx half to two thirds the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, *c.* 4.5 mm long (including caruncle), 3 mm wide and 2.5 mm deep; testa pale brown; caruncle  $\pm$  hemispherical, *c.* 0.8 mm long and 1.5 mm wide,  $\pm$  smooth, greyish-white. **Fig. 4.**

**Additional specimens examined:** Western Australia. Gorge, Helena Valley, Aug 1987, *Cole s.n.* (PERTH); Pages Way, Gosnells, Sep 1978, *Cranfield 509* (CANB, MEL, PERTH); between Bottle Rock and Dragon Rock, Jun 1970, *George 9893* (BRI, PERTH); Dragon Rocks Nature Reserve on track *c.* 2 km NW of junction of Dragon Rocks road and Newdegate road North, Aug 1986, *Hopper 5269* (BRI); William St, Herne Hill, Jun 1986, *Patrick 254* (PERTH); Padbury ave, Herne Hill, Jun 1985, *Patrick 165* (PERTH); *c.* 300 m E of Range road, adjacent to E end of William Street, Herne Hill, Nov 1989, *Patrick s.n.* (BRI); Helena Valley, Jun 1978, *Seabrook 559* (PERTH).

**Distribution and habitat:** *Ricinocarpus graniticus* is confined to south-western Western Australia where it is restricted to a small area of the Darling Range east of Perth with a disjunct population at Dragon Rock Nature Reserve north of Newdegate (**Map 9**). It is recorded as growing on granite outcrops, in low scrub with *Corymbia calophylla* and *Eucalyptus wandoo* in a gully at the base of granite sheet and on a small granite exposure fringed by *Thryptomene australis*, *Hakea petiolaris* and *Acacia lasiocalyx*.

**Phenology:** Flowers have been collected in June, August and September, fruits from August to November.

**Affinities:** *Ricinocarpus graniticus* is similar to *R. psiloclados* (Müll.Arg.) Benth., also



**Fig. 4.** *Ricinocarpus graniticus*. A. flowering and fruiting branchlet  $\times 2$ . B. adaxial leaf surface  $\times 4$ . C. transverse section of leaf  $\times 16$ . D. side view of male flower  $\times 4$ . E. side view of female flower  $\times 4$ . F. face view of female flower  $\times 4$ . G. side view of fruit  $\times 4$ . H. face view of fruit  $\times 4$ . I. ventral view of seed  $\times 8$ . J. side view of seed  $\times 8$ . A–J from Forster PIF30387 (BRI). Del. W.Smith.



from the south-west of Western Australia, but can be distinguished from that species by its narrower leaf blades (1.2–1.5 mm wide compared with (1.5–) 2.5–7 mm wide in the latter species) with the adaxial surface smooth rather than tuberculate and with the margins recurved to revolute to the midrib to hide the abaxial surface except for the midrib, not merely somewhat recurved.

**Etymology:** The specific epithet refers to granite rock outcrops upon or near where this species is found.

**9. *Ricinocarpus ledifolius*** F.Muell., *Fragm.* 1: 76 (1859) (*'Ricinocarpus'*); *Roeperia ledifolia* (F.Muell.) Kuntze, *Revis. Gen. Pl.* 2: 618 (1891). **Type:** [Queensland.] Burdekin, *s.d.*, *F. Mueller s.n.* (lecto [here chosen]: MEL 26456; isolecto: K [ex herb. Hook.]).

**Illustration:** Stanley & Ross (1983: 425, fig. 66c).

Monoecious or dioecious, spreading, open **shrubs or small trees** to 5 m high, shoot apices and flower buds with ferruginous indumentum. Young branchlets terete, with a dense greyish-white indumentum; hairs stellate, sessile or shortly stipitate, multiangulate, < 0.4 mm across, with stipes < 0.1 mm long. Older branchlets with surface becoming shallowly, longitudinally, reticulately fissured, greyish in colour. **Leaves** petiolate, spirally alternate; petioles 2–5 mm long, densely hairy with hairs as for branchlets; blades linear to narrow-oblong, very narrow-ovate or very narrow-elliptic to narrow-elliptic, (25–) 30–75 (–90) mm long, 3–12 (–15) mm wide, with a length/width ratio of 3–17:1; adaxial surface stellate-pubescent when young but becoming glabrous except for scattered persistent hairs along the midline, smooth; abaxial surface pubescent with soft white stellate hairs up to 0.2 mm across; base cuneate to obtuse; margins recurved; apex acute, obtuse or rounded; midvein impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands absent or occasionally present on blade, up to 3 mm from base, 1 each side of midrib, sessile, smooth, c. 0.3 mm across. **Inflorescences** of a single male or female flower, or ± umbelliform with

2 or 3 female flowers, 2–6 male flowers or 2–6 triads with each triad consisting of a central female flower and 2 subtending male flowers, terminal on branchlets; bracts and bracteoles narrow-ovate, 2–8 mm long, ± glabrous adaxially, stellate-pubescent abaxially, caducous. **Flowers** conspicuous; pedicel densely hairy with a mixture of ferruginous and greyish-white stellate hairs; calyx 5-lobed; petals 5 (rarely 6), slightly shorter to slightly longer than calyx; disc a glandular ring. **Male flowers:** pedicel slender, 8–20 mm long; calyx densely pubescent with a mixture of ferruginous and greyish-white stellate hairs abaxially, white stellate-pubescent adaxially, lobes ovate to semi-elliptic, 3–5 mm long, 2.2–4.3 mm wide, acute, obtuse or rounded at the apex; petals ovate or semi-elliptic, 3.5–6 mm long, 2–4 mm wide, white, glabrous, with margins few-notched, obtuse to rounded at the apex; disc 0.2–0.8 mm long, dorsi-ventrally compressed, stellate-hairy adaxially, ± glabrous abaxially, irregularly toothed distally; central column 1.5–2 mm long, tomentose; stamens 40–50; free portion of filaments c. 2 mm long, erect to spreading at anthesis, glabrous; anthers c. 0.8 mm long. **Female flowers:** pedicel stout, 7–12 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes ovate to semi-elliptic, 3–4 mm long, 2–3 mm wide, acute to obtuse at the apex; petals ± elliptic, 3.7–4.5 mm long, 1.6–3.7 mm wide, white, glabrous, with margins entire, rounded at the apex, marcescent; disc as for male flowers; ovary subglobose, 3-sulcate, 1.5–1.7 mm long, densely stellate-pubescent; style ± obsolete; stigmatic limbs 1.8–3 mm long, glabrous; lobes spreading to ± upwardly curving, ± dorsi-ventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** depressed ellipsoidal, trilobate, 5–6 mm long, 7–7.5 mm across, stellate-tomentose, usually 3-seeded; calyx c. a quarter the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 4.5–5 mm long (including caruncle), 3–3.2 mm wide, 2.7–2.8 mm deep; testa pale brown; caruncle ± hemispherical, c. 0.4 mm long and 1 mm wide, ± smooth, yellowish-white.

**Additional selected specimens (from 59 examined):** Queensland, NORTH KENNEDY DISTRICT: Rishton Scrub, 30 km SE of Charters Towers, Sep 1991, *Thompson*



253 & Dillewaard (BRI); Rochford Scrub, 25 km W of Ravenswood, Sep 1991, *Thompson 222 & Dillewaard* (BRI). SOUTH KENNEDY DISTRICT: 6 miles [c. 10 km] W of 'Dabin' Station, Jul 1964, *Adams 1089A* (AD, BRI, PERTH); 'Blenheim', Apr 1993, *Fensham 817* (BRI); 'Eaglefield', Oct 1993, *Fensham 1202* (BRI); Lizzie Creek road, off Eungella to Collinsville road, Apr 2000, *Forster PIF25533 & Booth* (BRI). LEICHHARDT DISTRICT: W slopes of Gogango Range, c. 20 km ESE of Duaringa, Jun 1983, *Anderson 3432* (BRI); c. 17 km ESE of Duaringa, Sep 1988, *Anderson 4516* (BRI); 9.9 km W of junction of old inland Highway (Marlborough – Sarina) on Oxford Downs–Sarina road, S of Pine Mt, Aug 1996, *Champion 1382 & Canning* (BRI); Palmgrove N.P., NW of Taroomb, Nov 1998, *Forster PIF23810 & Booth* (BRI); Rockhampton–Duaringa road, c. 16 km from Duaringa, Aug 1973, *Moriarty 1357* (CANB). PORT CURTIS DISTRICT: Wedge Island, Keppel Bay, Nov 1987, *Batianoff 9822 & Dillewaard* (BRI); Peak Island, Keppel Bay, Nov 1987, *Batianoff 9860 & Dillewaard* (BRI); Spring Creek, 5 km NNE of 'Craiglands' Homestead, Sep 1989, *Forster PIF5709 & Bean* (BRI). BURNETT DISTRICT: Old Cannindah, 11 km SE of Monto, Nov 1995, *Bean 9204 & Turpin* (BRI). WIDE BAY DISTRICT: Stony Creek, 4 km E of Didcot, Sep 1988, *Forster PIF4711* (BRI, MEL). DARLING DOWNS DISTRICT: Freestone area, 5.5 km SW of Gladfield, Nov 1977, *McDonald 2007* (BRI). MORETON DISTRICT: Burtons Gully, 10 km WSW of Mt Whitestone, Oct 1985, *Forster PIF2252 & Bird* (BRI).

**Distribution and habitat:** *Ricinocarpus ledifolius* is confined to Queensland from Townsville southward to near Warwick (**Map 10**). It is most commonly recorded as growing on rocky sites in semi-evergreen vine thicket and vine forest communities.

**Phenology:** Flowers have been collected throughout the year particularly from July to November, fruits in January, April, June and November.

**Affinities:** *Ricinocarpus ledifolius* is similar to *R. speciosus* Müll.Arg. but differs from that species in having smaller petals and fruits, shorter petioles and generally smaller leaves.

**Typification:** Mueller (1859) did not cite any particular specimens in his protologue of *Ricinocarpus ledifolius* but made a comment on the distribution and habitat of the species, viz. "In virgultis sic dictis Brigalow Scrub Australiae orientalis calidioris" [in scrubs so called brigalow scrub of warm eastern Australia]. We have located four sheets (two at MEL [26456, 26450] and two at K) collected by Mueller from central Queensland when he accompanied A.C.Gregory on the North Australian Exploring Expedition (1855–

1857). There appears to be two collections, one labelled "*Ricinocarpus* (*Bertya*) *ledifolius*, Burdekin" and the other labelled "*Ricinocarpus* (*Bertya*) *ledifolius* var. *volubilis*, Burdekin". These collections are considered to be at least part of the material used by Mueller in describing *R. ledifolius*, as their collection predates Mueller's publication of the name *R. ledifolius*, are labelled in Mueller's hand with the name *Ricinocarpus ledifolius* and agree with the description in the protologue. The sheet MEL26456 is selected here as lectotype and the K sheet labelled "*Ricinocarpus* (*Bertya*) *ledifolius*, Burdekin" is considered to be an isoelectotype.

**10. *Ricinocarpus linearifolius*** Halford & R.J.F.Hend. **species nova** *R. bowmanii* F.Muell. et *R. trachyphyllo* Halford & R.J.F.Hend. maxime affinis. A *R. bowmanii* foliorum lamina pagina adaxiali levi non scabra et pagina abaxiali sericea non pubescenti et foliis proportione longioribus (folii lamina ratione longitudinis ad latitudinem 20–32:1 non 3–15:1) differt. A *R. trachyphyllo* foliorum lamina pagina adaxiali levi non scabra et indumento implexo tomentoso non villosa in pedicellis et calycum pagina adaxiali differt. Etiam *R. linearifolius* ad *R. gloria-medii* J.H.Willis simulat foliis linearibus et floribus amplitudinis similis sed foliis petiolo brevioribus floribus maribus staminibus paucioribus foliorum lamina pagina abaxiali indumento sericeo non tomentoso et plerumque angustiore et pagina adaxiali mox glabra et plus minusve nitida non plerumque sparsim pubescenti stellata et impolita differt. **Typus:** Queensland. LEICHHARDT DISTRICT: Blackdown Tableland, near lookout and picnic area beside road at northern end, 16 October 1987, *R.J.F.Henderson H3104* (holo: BRI; iso: CANB, MEL, NSW, K, distribuendi).

*Ricinocarpus* sp. (Blackdown Tableland R.J.Henderson H610), Forster & Halford (2002: 73; 2007: 72).

**Illustrations:** Williams (1979: 254) as *R. bowmanii*; Williams (1999: 340) as *R. aff. R. bowmanii*.

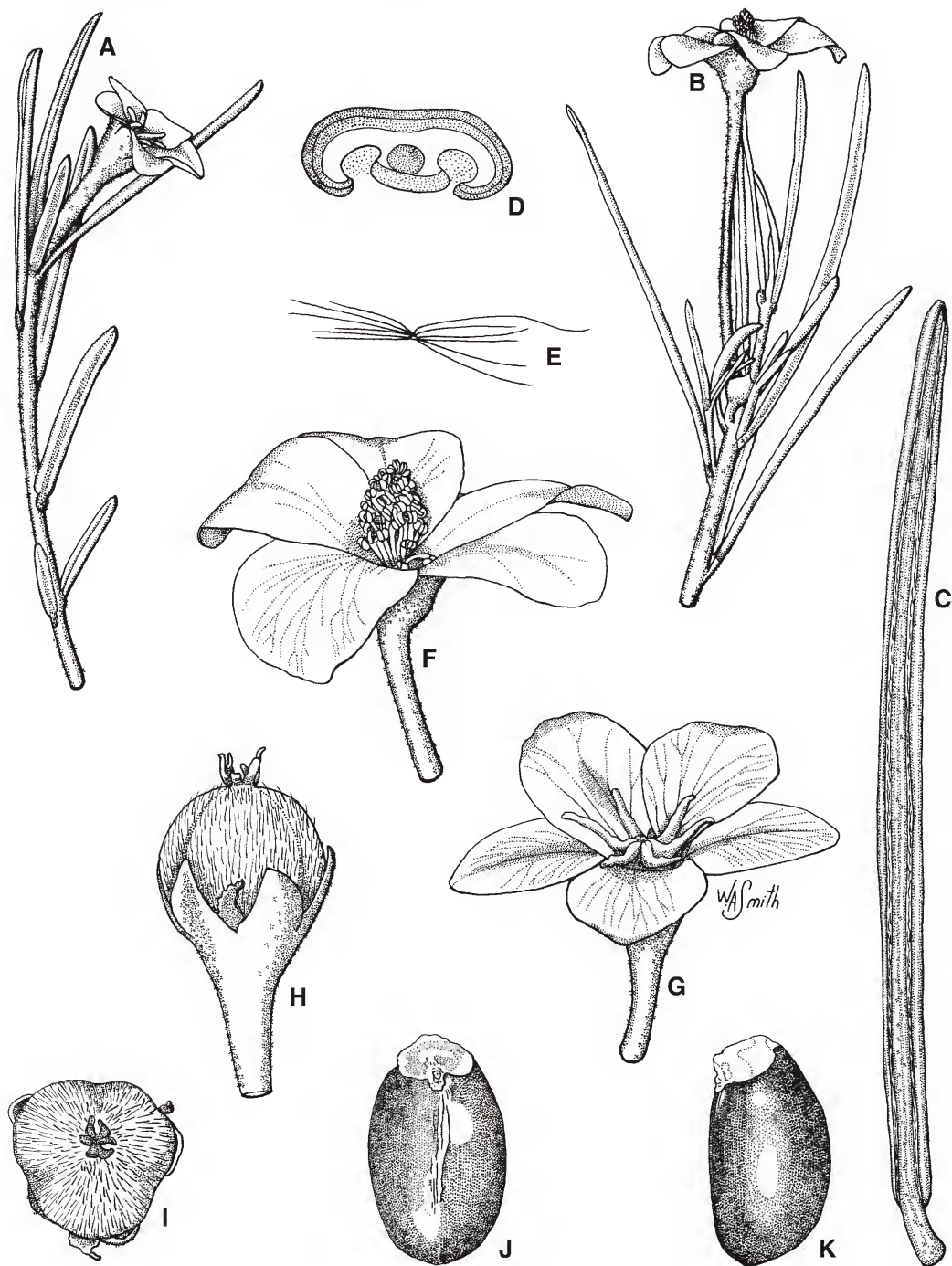
Monoecious or dioecious **shrubs** to 1 (–2) m high, shoot apices and flower buds with ferruginous indumentum. Young branchlets

terete, with a dense grey-white indumentum; hairs stellate, sessile or shortly stipitate, multiangulate, < 0.3 mm across, with stipes < 0.1 mm long. Older branchlets shallowly longitudinally fissured,  $\pm$  dark grey. **Leaves** petiolate, spirally alternate or occasionally subopposite; petioles 0.8–1.5 mm long, densely hairy with hairs as for branchlets; blades linear, (8–) 15–45 (–50) mm long, 1–1.3 mm wide, with a length/width ratio of 20–32:1; adaxial surface stellate-pubescent when young but soon becoming glabrous and smooth; abaxial surface sericeous with loosely appressed soft stellate hairs, up to 2 mm across; base cuneate or truncate; margins revolute to midrib so that only midrib of abaxial surface of leaf blade is visible; apex obtuse to rounded or acute and usually mucronate with extension from midrib; midvein obscure or slightly impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands present at base blade, 1 per side of midrib,  $\pm$  sessile or stipitate, smooth, c. 0.1 mm across; stipes up to 0.3 mm long. **Inflorescences** of a single male or female flower, or umbelliform with either 2–4 male flowers or one central female flower surrounded by up to 3 male flowers, terminal on branchlets; bracts linear to lanceolate, 3–4 mm long,  $\pm$  glabrous adaxially, densely stellate-pubescent abaxially, caducous; bracteoles lanceolate, 2–3 mm long, glabrous abaxially, sparsely stellate-pubescent adaxially, readily caducous. **Flowers** conspicuous; pedicel densely hairy with ferruginous stellate hairs; calyx 5-lobed; petals 5, slightly longer than calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 4–15 (–25) mm long; calyx densely tomentose with ferruginous stellate hairs abaxially, white stellate-tomentose adaxially, lobes ovate, 3–4.5 mm long, 1.8–2.7 mm wide, acute at the apex; petals broad-obovate or suborbicular, (5–) 6.2–10 mm long, (3.4–) 4.2–5.5 mm wide, white, glabrous, with margins entire, rounded or acute at the apex; disc-glands 0.5–0.8 mm long, dorsi-ventrally compressed, glabrous except for scattered stellate hairs distally, rounded to truncate at apex; central column (1.7–) 3.5–5.7 mm long, tomentose; stamens 40–50; free portion of filaments 1–1.7 mm long, erect to spreading or decurving at

anthesis, glabrous; anthers 0.5–0.8 mm long. **Female flowers:** pedicel stout, 5–20 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes ovate, 4–5 mm long, 2.2–3 mm wide, acute at the apex; petals broad-obovate to obovate, (6.5–) 7.5–9.3 mm long, 3.5–6.2 mm wide, white, glabrous, with margins entire, obtuse to rounded at the apex, marcescent; disc-glands as for male flowers; ovary subglobose, 3-sulcate, 2.2–3.4 mm long, densely stellate-villose; style  $\pm$  obsolete; stigmatic limbs 1.7–3.5 mm long, glabrous adaxially, scattered stellate hairs proximally abaxially; lobes  $\pm$  spreading,  $\pm$  dorsi-ventrally compressed but shallowly grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** subglobose or rarely ovoid, trilobate, 7.5–9.5 (–12) mm long, 8–9.5 mm across, stellate-villose, usually 3-seeded; calyx < half the length of mature fruit. **Seeds** ovoid, dorsi-ventrally compressed, 5.6–6.4 mm long (including caruncle), 3.3–3.8 mm wide, 2.6–3 mm deep; testa dark red-brown; caruncle  $\pm$  hemispherical, 0.7–0.9 mm long, 1.8–2.1 mm wide,  $\pm$  smooth, white. **Fig. 5.**

**Additional selected specimens (from 72 examined):**

**Queensland.** LEICHHARDT DISTRICT: Salvator Rosa N.P., Sentinel Mountain, Sep 1990, *Ballingall 2651* (BRI); N of Mt Mooloolong, Ka Ka Mundi N.P., via Springsure, May 1999, *Bean 14838* (BRI); 11 km past Glenhaughton on Mapala road, Apr 1992, *Forster PIF9759* & *Machin* (BRI, K, MEL); Blackdown Tableland, Sep 1973, *Hanger 128* (BRI); Blackdown Tableland, 32 km SE of Blackwater, Apr 1971, *Henderson H610 et al.* (BRI, MEL, NSW); Blackdown Tableland, 12 miles [c. 19 km] SSE of Bluff, Sep 1959, *Johnson 955* (BRI); Blackdown Tableland, Aug 1990, *Jones 6335* & *Jones* (CANB); Stony Creek track, Blackdown Tableland, Sep 1974, *Williams 74029* (BRI). PORT CURTIS DISTRICT: Kroombit Tops, S.F. 316, Mar 1995, *Thompson BIL171 et al.* (BRI). BURNETT DISTRICT: Eidsvold to Cracow road, 1 km N of Little Morrow Creek crossing, Jan 1992, *Forster PIF9364* (BRI, K, MEL); 9.1 km S of Rawbelle road along powerline access road, Sep 1997, *Thomas & Holland s.n.* (BRI [AQ657979]). WIDE BAY DISTRICT: Mt Walsh summit, Mt Walsh N.P., Aug 1996, *Forster PIF19538 et al.* (BRI). WARREGO DISTRICT: Ticker Creek, Mt Tabor Station, Sep 1991, *Thomas s.n. et al.* (BRI [AQ543527]). MARANO DISTRICT: 8 km N of 'Yoothappinna', Sep 1974, *Gittins 2753* (BRI, NSW); The Chimneys, 140 km NW of Injune in Carnarvon N.P., Sep 1997, *Jobson 4949* (BRI); Mt Moffatt N.P., The Tombs area, Sep 1993, *Purdie 4283* (BRI); Carnarvon N.P., Mt Moffatt Section, Sep 1986, *Thomas 76* (BRI). DARLING DOWNS DISTRICT: 14.1 km ESE of Inglewood, Coolmunda Environmental Park, Oct 1993, *Halford Q1972* (BRI). **New South Wales.** Warialda S.F. 417 north, Nov 1996, *Forster PIF20093* (BRI); Warialda S.F. 417, Dec 1995, *Forster PIF18236* (BRI).



**Fig. 5.** *Ricinocarpus linearifolius*. A. branchlet with female flower  $\times 1.5$ . B. branchlet with male flower  $\times 1.5$ . C. adaxial leaf surface  $\times 4$ . D. transverse section of leaf  $\times 18$ . E. stellate hair, from abaxial leaf surface  $\times 18$ . F. side view of male flower  $\times 3$ . G. side view of female flower  $\times 3$ . H. side view of fruit  $\times 3$ . I. face view of fruit  $\times 3$ . J. ventral view of seed  $\times 6$ . K. side view of seed  $\times 6$ . A from Halford Q8194A & Edginton (BRI); B–F from Halford Q8194B & Edginton (BRI); G from Henderson H3123 (BRI); H–K from Henderson H3104 (BRI). Del. W.Smith.



**Distribution and habitat:** *Ricinocarpus linearifolius* has a disjunct distribution and occurs from near Jericho south-eastwards to Biggenden and near Inglewood in southern Queensland as well as in the Warialda district in northern New South Wales (**Map 11**). It is recorded as growing in heathland, woodland and open forest communities on sandy soils usually associated with sandstone outcrops. It is also recorded as growing on granite and rhyolite substrates.

**Phenology:** Flowers have been collected throughout the year, but particularly from August to October, fruits in March and from September to December.

**Affinities:** *Ricinocarpus linearifolius* is most closely allied to *R. bowmanii* and *R. trachyphyllus*. It differs from *R. bowmanii* in its leaf blades with a smooth rather than scabrous adaxial surface and an abaxial surface with a sericeous rather than pubescent indumentum, and in its proportionally longer leaves which have a blade length/width ratio of 20–32:1 compared with 3–15:1 as in *R. bowmanii*. It differs from *R. trachyphyllus* in the smooth rather than scabrous adaxial surface of leaf blades and a matted tomentose rather than shaggy villous indumentum on pedicels and the adaxial surface of the calyces. *Ricinocarpus linearifolius* resembles *R. gloria-medii* in having linear leaves and similar sized flowers, but differs from that in having shorter petioles, fewer stamens in each male flower, a sericeous indumentum on the abaxial surface of the generally narrower leaf blades the adaxial surface of which soon becomes glabrous with a more or less shiny appearance, whereas those of *R. gloria-medii* usually retain a covering of some hairs.

**Etymology:** The specific epithet is from Latin *linearis* (linear), and *-folius* (leaved), in reference to the shape of leaf blades in this species.

**11. *Ricinocarpus marginatus* Benth., *Fl. Austral.* 6: 73 (1873) ('*Ricinocarpus*'); *Roeperia marginata* (Benth.) Kuntze, *Revis. Gen. Pl.* 2: 619 (1891). **Type:** [Western Australia] York Sound, September 1820, *A. Cunningham* 283 (lecto [here chosen]; K; isolecoto: BRI, K [ex herb. Benth.], PERTH).**

**Illustration:** Wheeler (1992: 627, fig. 192b).

Monoecious, erect **shrubs** to 3 m high. Young branchlets angular, with a moderately dense white indumentum; hairs stellate, sessile, multiangulate, < 0.8 mm across. Older branchlets terete, with surface becoming striate, pale brown. **Leaves** petiolate, spirally alternate; petioles 1–6 mm long, densely hairy with hairs as for branchlets; blades very narrow-elliptic, 45–90 mm long, 8–20 mm wide, with a length/width ratio of 3–8:1; adaxial surface stellate-puberulous or glabrous except for stellate hairs along the margins and midline; abaxial surface tomentose or pubescent with soft white stellate hairs up to 0.4 mm across; base cuneate; margins  $\pm$  flat; apex acute; midvein slightly impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure or slightly impressed adaxially, raised abaxially; marginal glands usually present at base of blade, 1 each side of midrib, sessile, smooth, 0.2–0.6 mm across. **Inflorescences** umbelliform with either all male flowers or 1–3 female flowers surrounded by many male flowers, terminal on branchlets but soon appears lateral as it is overtopped by growth of axillary buds; bracts and bracteoles oblong, < 2 mm long, densely stellate-pubescent, caducous. **Flowers**  $\pm$  inconspicuous; pedicel white stellate-pubescent; calyx 5-lobed; petals 5, slightly shorter than calyx; disc a glandular ring. **Male flowers:** pedicel slender, 3–8 mm long; calyx white stellate-pubescent abaxially and adaxially, lobes ovate to semi-elliptic, *c.* 2.5 mm long, and 2 mm wide, obtuse to rounded at the apex; petals obovate, *c.* 2 mm long, and 2 mm wide, white, glabrous, with margins erose, rounded at the apex; disc 0.4–0.5 mm long, dorsio-ventrally compressed, glabrous, sinuate distally; central column 2.5–3 mm long, tomentose proximally; stamens *c.* 25; free portion of filaments 0.8–1 mm long, erect to spreading at anthesis, glabrous; anthers *c.* 0.5 mm long. **Female flowers:** pedicel stout, trigonous, 6–15 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes narrow-ovate, 3–4 mm long, 1.2–2 mm wide, acute to obtuse at the apex; petals narrow-oblong, *c.* 3 mm long and 1 mm wide, white, stellate-pubescent abaxially



and adaxially, with margins entire, rounded at the apex, caducous; disc as for male flowers; ovary ovoid, trilobate, *c.* 3 mm long, densely stellate-pubescent; style *c.* 1.5 mm long, stellate-pubescent; stigmatic limbs *c.* 1.2 mm long, glabrous adaxially, stellate-pubescent proximally abaxially; lobes spreading to  $\pm$  upwardly curving,  $\pm$  laterally compressed, verrucose adaxially, smooth abaxially. **Fruits** ellipsoidal, trilobate, 7–8 mm long, 5–6 mm across, stellate-pubescent, usually 3-seeded; calyx *c.* a quarter the length of mature fruit. **Seeds** ovoid, dorsi-ventrally compressed, *c.* 6 mm long (including caruncle), 3.2 mm wide and 2.8 mm deep; testa pale brown; caruncle  $\pm$  hemispherical, *c.* 1 mm long and 1.7 mm wide,  $\pm$  smooth, yellowish-white.

**Additional specimens examined:** Western Australia. *c.* 10 km S of Swift Bay, off Montague Sound, Jun 1985, Fryxell 4665 *et al.* (CANB, DNA, K, MEL, PERTH); unnamed tributary of the Mitchell River, Dec 1982, Kenneally 8679 (BRI, PERTH); Amax Survey Pool, Mitchell Plateau, Jun 1971, Maconochie 1277 (DNA, PERTH); Bigge Island, Jun 2003, Coate 682 (PERTH).

**Distribution and habitat:** *Ricinocarpus marginatus* is confined to the Kimberley region of Western Australia where it has been recorded from York Sound, Montague Sound and the Mitchell Plateau (**Map 12**). It is recorded as growing amongst sandstone rocks and in eucalypt woodland on sandstone.

**Phenology:** Flowers have been collected in June and December, fruits in June.

**Affinities:** *Ricinocarpus marginatus* is similar to *R. rosmarinifolius* Benth. and *R. trichophyllus*. It differs from *R. rosmarinifolius* in having narrow-elliptic leaves. For features distinguishing *R. marginatus* from *R. trichophyllus*, refer to the 'Affinities' section under that species.

**Typification:** In the protologue of *Ricinocarpus marginatus*, Bentham (1873) cited a single collection from York Sound, Western Australia, collected by A. Cunningham. Three sheets (one each at BRI, K and PERTH) matching the locality and collector's name have been located. The sheet at K has two specimens on it, one stamped as coming from Herb. Benthamianum and the other from Allan Cunningham's Australian Herbarium. All of this material agrees with the description

in the protologue of *R. marginatus*. The latter specimen is selected here as lectotype of the name because it is the more ample of the two collections held at K.

**12. *Ricinocarpus megalocarpus*** Halford & R.J.F.Hend. **species nova** *R. tuberculato* Müll. Arg. maxime affinis sed fructibus majoribus (14–16 mm longis et 10–13 mm latis non 10–12 mm longis et 7–8 mm latis) pagina valde tuberculata non laevi ad leniter tuberculatam et foliorum lamina latiore (1.6–1.8 mm lata non 0.8–1.3 mm lata) et proportionem brevior (ratione longitudinis ad latitudinem 6–12:1 non 15–20:1) differt. **Typus:** Western Australia. Duke of Orleans Bay, *c.* 64 km E of Esperance, 30 September 1968, P.G. Wilson 8093 (holo: PERTH; iso: MEL).

Monoecious or apparently sometimes dioecious, compact, rounded **shrubs** up to 2.5 (–4) m high. Young branchlets  $\pm$  terete, glabrous. Older branchlets with surface becoming shallowly longitudinally fissured, grey. **Leaves** petiolate, spirally alternate; petioles 1.5–2 mm long, glabrous; blades linear, 9–20 mm long, 1.6–1.8 mm wide, with a length/width ratio of 6–12:1; adaxial surface glabrous and smooth; abaxial surface pubescent with white sessile stellate hairs  $< 0.1$  mm across; base cuneate; margins recurved to midrib; apex obtuse to acute, ultimately mucronate with extension from midrib; mucro up to 0.4 mm long, downwardly curved; midvein obscure or slightly impressed adaxially, abaxially raised and glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** of a single male or female flower, or  $\pm$  umbelliform with either all male flowers or one female flower surrounded by up to 6 male flowers, terminal on branchlets; bracts and bracteoles, triangular or lanceolate, 3–7 mm long, glabrous, readily caducous. **Flowers** conspicuous; pedicel glabrous; calyx 5-lobed; petals 5 (rarely 6), at least twice as long as calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 8–22 mm long; calyx glabrous adaxially, densely hairy with white crispate hairs adaxially, lobes broad-ovate, 1.3–1.7 mm long, 1.7–1.9 mm wide, obtuse at the apex; petals narrow-obovate, 9.5–11 mm long, 3.5–4.5 mm wide, white, glabrous

except for tuft of hairs proximally on adaxial surface, with margins entire, rounded at the apex; disc-glands 0.3–0.5 mm long, dorsi-ventrally compressed, glabrous, truncate to obtuse at apex; central column 3–3.5 mm long, tomentose; stamens c. 55; free portion of filaments 0.3–0.5 mm long, erect at anthesis, glabrous; anthers 0.6–0.8 mm long. **Female flowers:** pedicel stout, 4–15 mm long; calyx caducous, indumentum as for calyx of male flowers, lobes broad-ovate to triangular, 1.5–2.1 mm long, 1.5–1.7 mm wide, obtuse or acute at the apex; petals narrow-obovate, 11–12 mm long, 3.5–4 mm wide, white, glabrous except for tuft of hairs proximally on adaxial surface, with margins entire, rounded at the apex, caducous; disc-glands as for male flowers; ovary ovoid, 2.3–2.5 mm long, glabrous, tuberculate; style  $\pm$  obsolete; stigmatic limbs of unknown colour when fresh, 1.5–1.8 mm long, glabrous; lobes spreading,  $\pm$  dorsi-ventrally compressed but shallowly grooved abaxially, verrucose adaxially,  $\pm$  smooth abaxially. **Fruits** ovoid, trilobate, 14–16 mm long, 10–13 mm across, glabrous, strongly tuberculate, with short acuminate beak, usually 3-seeded. **Seeds** ellipsoid to ovoid, slightly dorsi-ventrally compressed, 8.5–9.5 mm long (including caruncle), 4.1–4.2 mm wide, 3.5–3.8 mm deep; testa pale to light brown with blotches of dark brown; caruncle  $\pm$  conical, 1.5–2 mm long, 1.2–1.8 mm wide,  $\pm$  smooth, creamy white. **Fig. 6.**

**Additional selected specimens (from 26 examined):** **Western Australia.** Duke of Orleans Bay, Oct 1970, *Aplin* 4248 (PERTH); Esperance, Oct 1965, *Burns* 2 (PERTH); Cape Le Grand N.P., between Rossiter Bay car park and the Bird Sanctuary, Sep 1985, *Carter* 152 (CANB); Cape Le Grand N.P., Hellfire Bay, Sep 1985, *Corrick* 9519 (MEL); Hellfire Bay, Cape Le Grand N.P., Nov 1976, *Demarz* D6286 (PERTH); Duke of Orleans Bay, c. 63 km E of Esperance, Sep 1968, *Donner* 2739 (CANB, PERTH); SE corner of Lucky Bay, Oct 1966, *Filson* 9257 (MEL); Cape Le Grand N.P. - Rossiter Bay, Oct 1982, *Forbes* 1065 (MEL); Rossiter Bay, Cape Le Grand N.P., Nov 1985, *Foreman* 1270 (MEL); Cape Arid, Oct 1960, *Gardner* 12951 (PERTH); Whistling Rock in Thistle Cove, Cape Le Grand N.P., Oct 1973, *Garraty* 353 (PERTH); Rossiter Bay, Cape Le Grand N.P., Sep 1988, *Henderson* H3182 (BRI); Duke of Orleans Bay, opposite Hig Island, Oct 1968, *Orchard* 1308 (PERTH); Cape Arid N.P., E of Esperance, Nov 1971, *Royce* 9818 (PERTH); Duke of Orleans Bay, Sep 1990, *Short* 3895 (MEL); Taylor Boat Harbour, 90 km E of Esperance, Sep 1976, *Story* 8273 (CANB, PERTH); Thistle Cove,

Cape Le Grand N.P., Nov 1982, *Strid* 21223 (PERTH); Mississippi Hill, Cape Le Grand N.P., Aug 1971, *Weston* 6781 (PERTH); Lucky Bay, c. 35 km ESE of Esperance, Oct 1966, *Wilson* 5594 (PERTH).

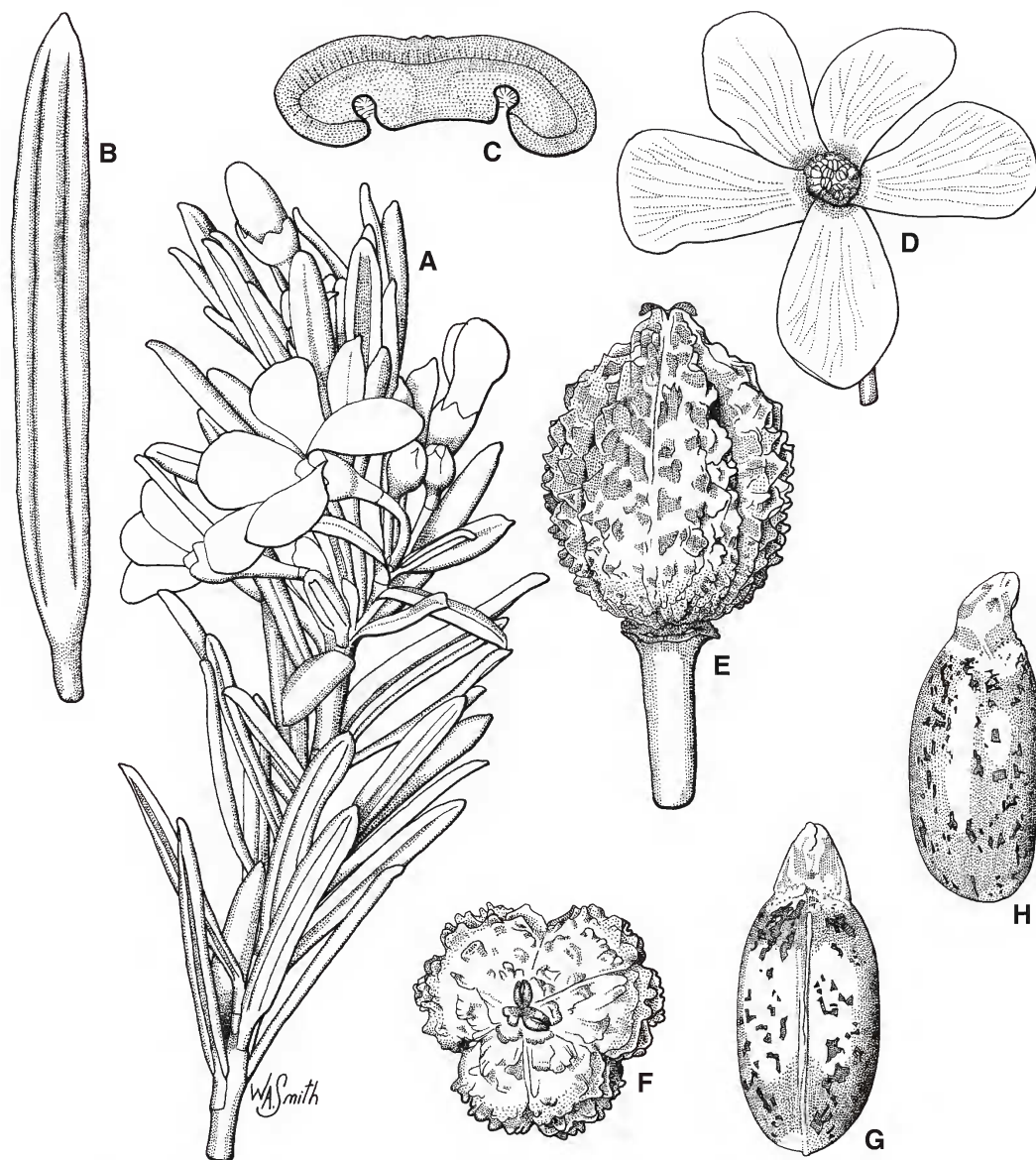
**Distribution and habitat:** *Ricinocarpus megalocarpus* is confined to the south coast of Western Australia where it occurs east of Esperance, from Cape Le Grand to Cape Arid (**Map 13**). It is recorded as growing in heath communities on sandy soils on coastal dunes though it has been recorded once on granite (*Demarz* D6282 (PERTH)).

**Phenology:** Flowers have been collected in January, February, June and from August to December, fruits in February and from August to December.

**Affinities:** *Ricinocarpus megalocarpus* is similar to *R. tuberculatus* but can be distinguished from that species by its larger fruit (14–16 mm long  $\times$  10–13 mm across compared with 10–12 mm long  $\times$  7–8 mm across), its sculpturing on the fruit surface (strongly tuberculate compared with smooth to weakly tuberculate), and its wider (1.6–1.8 mm wide compared with 0.8–1.3 mm wide) and proportionally shorter leaf blades (with a length/width ratio of 6–12:1 compared with 15–20:1).

**Etymology:** The specific epithet is derived from Greek *megalo-* (large), and *-carpus* (fruit), and refers to the fruit being larger than those of *R. tuberculatus*, to which it is most similar.

**13. *Ricinocarpus oliganthus*** Halford & R.J.F.Hend. **species nova** ad *R. psilocladum* (Müll.Arg.) Benth. maxime affinis sed foliis lamina minore (6–10 mm longa et 0.8–1.3 mm lata non 20–50 mm longa et (1.5–) 2.5–4 mm lata), florum pedicello brevior (3–5 mm longo non 5–16 mm longo) et foliorum lamina pagina adaxiali laevi non tuberculata facile distincta. **Typus:** Western Australia. 1.8 km NE of Canna Siding on Canna North East road, c. 38 km NNW of Morawa, 29 June 1996, *B.J.Lepschi* BJL2656 & *T.R.Lally* (holo: BRI; iso: CANB [and according to a label on the holotype, other isotypes are at AD and PERTH]).



**Fig. 6.** *Ricinocarpus megalocarpus*. A. flowering branchlet  $\times 2$ . B. adaxial leaf surface  $\times 4$ . C. transverse section of leaf  $\times 18$ . D. face view of male flower  $\times 3$ . E. side view of fruit  $\times 2.5$ . F. face view of fruit  $\times 2.5$ . G. ventral view of seed  $\times 4$ . H. side view of seed  $\times 4$ . A–H from Henderson H3182 (BRI). Del. W.Smith.

Monoecious, **shrubs** *c.* 1.8 m high, thinly resinous on most parts. Young branchlets  $\pm$  angular, glabrous. Older branchlets  $\pm$  terete, with surface becoming tessellated,  $\pm$  grey. **Leaves** mostly crowded towards the ends of branchlets, petiolate, spirally alternate; petioles *c.* 1 mm long, glabrous; blades linear to narrow-oblong, 6–10 mm long, 0.8–1.3 mm wide, with a length/width ratio of 7–12:1;

adaxial surface glabrous and smooth; abaxial surface puberulous with white stellate hairs  $< 0.05$  mm across; base cuneate; margins revolute to midrib; apex rounded; midvein impressed adaxially, abaxially raised, glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** of a single flower, terminal on branchlets; bracts and bracteoles



± oblong, 1–2 mm long, glabrous, resinous, caducous. **Flowers** conspicuous; pedicel glabrous; calyx 5-lobed; petals 5, slightly longer than calyx; disc a glandular ring. **Male flowers:** pedicel slender, 3–5 mm long; calyx glabrous abaxially and adaxially, resinous abaxially, margins minutely fimbriate, lobes ovate, 3–3.5 mm long, 1.5–2 mm wide, obtuse to acute at the apex; petals narrow-obovate, 7–7.5 mm long, c. 2.8 mm wide, white to creamy-white, glabrous, with margins entire, rounded to obtuse at the apex; disc c. 0.3 mm long, dorsi-ventrally compressed, glabrous, sinuate; central column c. 3 mm long, glabrous; stamens c. 45; free portion of filaments c. 1 mm long, ± erect at anthesis, glabrous; anthers c. 0.6 mm long. **Female flowers:** pedicel stout, 3–4 mm long; calyx persistent, glabrous abaxially and adaxially, resinous abaxially, margins minutely fimbriate, lobes ovate, 3–3.5 mm long, 2–2.4 mm wide, acute at the apex; petals narrow-elliptic, 4–4.2 mm long, 1.5–2.2 mm wide, white to creamy-white, glabrous, with margins entire, rounded at the apex, marcescent; disc as for male flowers; ovary subglobose, 1.3–1.7 mm long, glabrous, ± smooth; style ± obsolete; stigmatic limbs of unknown colour when fresh, c. 1.3 mm long, glabrous; lobes spreading, ± dorsi-ventrally compressed but shallowly grooved abaxially, ± smooth on both surfaces. **Fruits** ellipsoid, trilobate, 7.5–8 mm long, c. 6 mm across, glabrous, ± smooth, usually 3-seeded; calyx a half or two-thirds the length of mature fruit. **Seeds** not seen.

**Additional specimen examined:** Western Australia. G.Kowald property, Canna, Aug 2001, *Docherty* 107 (PERTH).

**Distribution and habitat:** *Ricinocarpos oliganthus* is known only from near Morawa, south-western Western Australia (**Map 14**). It is recorded as growing on gravelly, red-brown clay-loam in scrub with mallee eucalypts.

**Phenology:** Flowers and immature fruits have been collected in June.

**Affinities:** *Ricinocarpos oliganthus* is similar to *R. psilocladus* but is easily distinguished from that species by its smaller leaf blades (6–10 mm long × 0.8–1.3 mm wide compared with 20–50 mm long × (1.5–) 2.5–4 mm

wide), its flowers with a shorter pedicel (3–5 mm long compared with 5–16 mm long) and its leaf blades with a smooth rather than tuberculate adaxial surface.

**Etymology:** The specific epithet is from Greek, *olig-* (few), and *-anthus* (flowered), and refers to the inflorescences in this species.

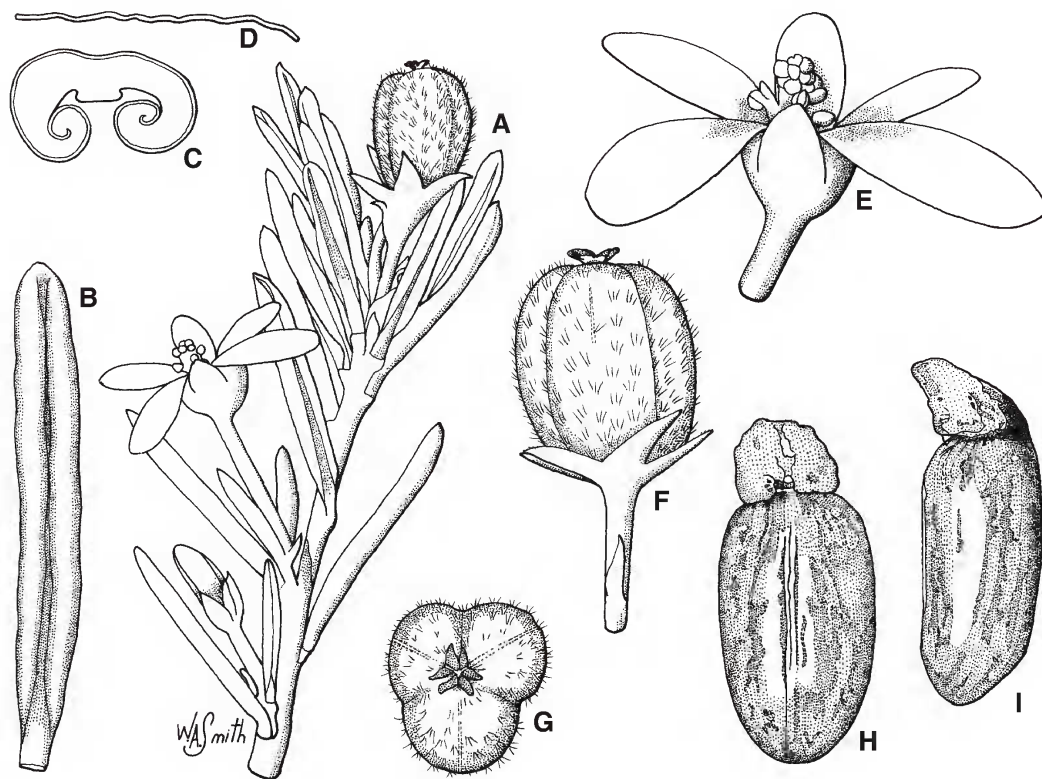
**14. *Ricinocarpos pilifer*** Halford & R.J.F.Hend. **species nova** *R. glauco* Endl. et *R. undulato* Lehm. maxime affinis sed ab eis speciebus ovario et fructu modice pubescenti non glabro differt. Ab *R. glauco* foliorum lamina pagina abaxiali indumento sericeo non lanato et ab *R. undulato* florum petalis brevioribus (6–8 mm longis non 7–15 mm longis) etiam differt. **Typus:** Western Australia. Mt Le Grand, c. 25 km SE of Esperance, 7 October 1966, *P.G.Wilson* 5575 (holo: PERTH).

Monoecious, compact **shrubs** up to 0.6 m high. Young branchlets subterete, moderately to densely hairy in two longitudinal bands; hairs simple, erect, up to 0.1 mm long. Older branchlets with surface becoming shallowly, longitudinally fissured and somewhat spongy, greyish-white. **Leaves** petiolate, spirally alternate; petioles 0.5–1.5 mm long, minutely hairy adaxially with appressed to spreading simple hairs, glabrous abaxially; blades narrow-oblong, 10–15 (–20) mm long, 1–1.7 (–2.5) mm wide, with a length/width ratio of 6–9:1; adaxial surface glabrous and smooth; abaxial surface sericeous with loosely appressed ± straight simple hairs, 1.5–2.3 mm long; base cuneate; margins recurved to midrib; apex obtuse to acute, ultimately mucronate with extension from midrib up to 0.3 mm long; midvein obscure adaxially, abaxially raised, glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** of a single male or female flower, or ± umbelliform with either 2–4 male flowers or one female flower surrounded by up to 2 male flowers, terminal on branchlets or sometimes appearing axillary due to reduction of lateral branchlet; bracts and bracteoles lanceolate or narrow-ovate, 1.3–3 mm long, sparsely hairy adaxial surface and on margins, glabrous abaxially, caducous. **Flowers** conspicuous;



pedicel glabrous; calyx 5-lobed; petals 5, at least twice as long as calyx in male flowers; disc of 5 discrete glands. **Male flowers** with pedicel slender, 5–13 mm long; calyx glabrous abaxially, sparsely villose with white crispate hairs adaxially, lobes narrow-ovate, 1.8–2.3 mm long, 0.8–1 mm wide, acute at the apex; petals narrow-obovate, 6.2–8 mm long mm long, 1.7–2.1 mm wide, creamy-white, glabrous except for tuft of hairs proximally on adaxial surface, with margins entire, rounded at the apex; disc-glands 0.3–0.5 mm long, dorsi-ventrally compressed, glabrous, truncate to rounded distally; central column 2–2.7 mm long, glabrous; stamens 20–30; free portion of filaments 1–1.3 mm long,  $\pm$  erect at anthesis, glabrous; anthers 0.4–0.5 mm long. **Female flowers** with pedicel stout, 2–6 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes triangular,

2.5–2.7 mm long, 0.9–1.2 mm wide, acute at the apex; petals not known, readily caducous; disc-glands as for male flowers; ovary ovoid, *c.* 2 mm long, moderately dense to densely hairy with ascending simple hairs *c.* 0.5 mm long; style  $\pm$  obsolete; stigmatic limbs of unknown colour when fresh, *c.* 1.2 mm long, glabrous; lobes spreading and recurved distally,  $\pm$  dorsi-ventrally compressed but shallowly grooved abaxially, smooth on both surfaces. **Fruits** ellipsoid, strongly trilobate, *c.* 7 mm long and 4.7 mm across, with a moderately dense indumentum of spreading to ascending simple hairs 0.3–0.5 mm long, usually 3-seeded; calyx *c.* one quarter the length of mature fruit. **Seeds** obloid, *c.* 5.5 mm long (including caruncle), 2.5 mm wide and 2 mm deep; testa pale brown; caruncle  $\pm$  hemispherical, *c.* 1.5 mm long and 2.5 mm wide,  $\pm$  smooth, yellowish-white. **Fig. 7.**



**Fig. 7.** *Ricinocarpus pilifer*. A. flowering and fruiting branchlet  $\times 3$ . B. adaxial leaf surface  $\times 6$ . C. transverse section of leaf  $\times 16$ . D. simple hair, from abaxial leaf surface  $\times 32$ . E. side view of male flower  $\times 6$ . F. side view of fruit  $\times 4$ . G. face view of fruit  $\times 4$ . H. ventral view of seed  $\times 8$ . I. side view of seed  $\times 8$ . A–D, F, G from *Malone 4* (PERTH); E from *Weston 6737* (PERTH); H, I from *Solomon 236* (BRI). Del. W.Smith.

**Additional specimens examined:** Western Australia. Cape Le Grand, Esperance, Aug 1960, *Malone 4* (PERTH); Cape Le Grand, Oct 1966, *Muir 4274* (MEL); about 400 m W of visitors book, on Thistle Cove–Hellfire Bay trail, Aug 1989, *Solomon 236* (BRI, PERTH); Mt Le Grand, Cape Le Grand N.P., Aug 1971, *Weston 6739* (PERTH); *loc. cit.*, *Weston 6737* (PERTH); *loc. cit.*, *Weston 6738* (PERTH).

**Distribution and habitat:** *Ricinocarpus pilifer* is confined to southern Western Australia where it is restricted to Mt Le Grand, east of Esperance (**Map 15**). It is recorded as growing in scrub on skeletal soil on granite, on a rocky outcrop near the ocean and on a mountain summit.

**Phenology:** Flowers have been collected in August and October, fruits in October.

**Affinities:** *Ricinocarpus pilifer* is similar to *R. glaucus* and *R. undulatus* Lehm. but differs from both of these species by its moderately dense hairy rather than glabrous ovary and fruit. It also differs from *R. glaucus* by its sericeous rather than woolly indumentum on the abaxial surface of the leaf blades and from *R. undulatus* in its flowers with shorter petals (6–8 mm long compared with 7–15 mm long).

**Etymology:** The specific epithet *pilifer*, Latin for ‘bearing hairs’, refers to the indumentum-bearing ovary and fruit of this species.

**15. *Ricinocarpus pinifolius*** Desf., *Mém. Mus. Hist. Nat.* 3: 459–461, t. 22 (1817); *Roeperia pinifolia* (Desf.) Spreng., *Syst. Veg.* 16<sup>th</sup> edn, 3: 147 (1826). **Type:** [New South Wales.] Port Jackson, *s.d.*, [*A. Baudin expedition*] (lecto [here chosen]: P 152766).

*Ricinocarpus megalanthus* Gand., *Bull. Soc. Bot. France* 66: 287 (1919) (*‘Ricinocarpus’*). **Type:** New South Wales. ad Port Jackson, [Sep 1898], *Maiden s.n.* (holo: LY *n.v.*; iso: ?NSW *n.v.*, *fide* McGillivray (1973: 353)).

*Ricinocarpus proximus* Gand., *Bull. Soc. Bot. France* 66: 287 (1919) (*‘Ricinocarpus’*). **Type:** Victoria. [November 1898,] *Walter s.n.* [ex herb. Walter] (holo: LY *n.v.*; iso: ?NSW *n.v.*, *fide* McGillivray (1973: 353)).

*Ricinocarpus sidifolius* F.Muell. ex Baill., *Étude Euphorb.* 344 (1858), (*‘R. sidaefolius’*), *nom. inval.*

**Illustrations:** Hutchinson (1969: 750, fig. 9); Williams (1979: 254); Costermans (1986: 213); Jeanes (1999: 67, fig. 10d); Jones & Jones (1999: 218); Corrick & Führer (2000: 82).

Monoecious or dioecious, open, erect **shrubs** to 3 m high. Young branchlets ± angular, glabrous. Older branchlets terete, with surface becoming shallowly, longitudinally fissured, ± dark grey. **Leaves** petiolate, spirally alternate; petioles 2–3 mm long, glabrous; blades linear, 10–45 mm long, 0.8–1.6 mm wide, with a length/width ratio of 14–40:1; adaxial surface glabrous, ± smooth; abaxial surface puberulous with soft white stellate hairs up to 0.1 mm across; base cuneate; margins recurved to midrib so that only midrib of abaxial surface of leaf blade is visible; apex acute, ultimately mucronate with extension from midrib; mucro straight, up to 0.6 mm long; midvein slightly impressed adaxially, abaxially raised and glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** of a single male or female flower, or ± umbelliform with either 2–6 male flowers or one female flower surrounded by up to 5 male flowers, terminal on branchlets; bracts lanceolate, 3–7 mm long, glabrous, caducous; bracteoles absent. **Flowers** conspicuous; pedicel glabrous; calyx 5-lobed; petals 5 (rarely 6 or 7), up to five times as long as calyx; disc of 5 (rarely 6 or 7) discrete glands. **Male flowers:** pedicel slender, 12–25 mm long; calyx glabrous abaxially, moderately hairy with white crispate hairs adaxially, lobes ± triangular, 1.2–3.7 mm long, 1–2.3 mm wide, acute at the apex; petals narrow-obovate, 7–13 mm long, 2–5 mm wide, white, glabrous except for tuft of simple white hairs proximally on adaxial surface, with margins entire, rounded at the apex; disc-glands 0.3–0.5 mm long, dorsiventrally compressed, glabrous, truncate-sinuate distally; central column 4–6 mm long, glabrous; stamens 25–40; free portion of filaments 0.3–0.6 mm long, spreading to erect at anthesis, glabrous; anthers c. 0.5 mm long. **Female flowers:** pedicel stout, 3–10 mm long; calyx caducous, indumentum as for calyx of male flowers, lobes triangular, 1.3–2.3 mm long, 1–1.5 mm wide, acute at the apex; petals narrow-obovate, 6–14 mm long, 2.5–5 mm

wide, white, glabrous except for tube of simple white hairs on adaxial surface, with margins entire, rounded at the apex, caducous; disc-glands as for male flowers; ovary  $\pm$  globose but somewhat trilobate, 2–3.2 mm long, glabrous,  $\pm$  verrucose; style c. 0.3 mm long, glabrous; stigmatic limbs 2.3–3.2 mm long, glabrous; lobes spreading to  $\pm$  upwardly curving,  $\pm$  terete but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** globose to depressed globose, trilobate, 8–12 mm long, 10–14 mm across, glabrous, spiculate with subulate processes up to 3 mm long, usually 3-seeded. **Seeds** ovoid, dorsi-ventrally compressed, 5.7–9 mm long (including caruncle), 3.2–4.2 mm wide, 2.9–3.8 mm deep; testa pale reddish-brown and blotched with dark brown; caruncle  $\pm$  hemispherical, 1–1.5 mm long, 2–2.5 mm wide,  $\pm$  smooth, yellowish-white.

**Additional selected specimens (from 311 examined):**

**Queensland.** PORT CURTIS DISTRICT: 2 km W of Rules Beach, near Baffle Creek, NE of Bundaberg, Oct 1996, *Bean 1090* (BRI); Shoalwater Bay, Freshwater sector, Jun 1999, *Brushe JB1955* (BRI). WIDE BAY DISTRICT: Burrum Coast N.P., Woodgate section, Oct 1996, *Forster PIF19903 & Leiper* (BRI, MEL); 5 km SW of Tinnanbar, Sep 1987, *Halford 1136* (BRI). MORETON DISTRICT: Tugun, Sep 1930, *Hubbard 3941* (BRI). **New South Wales.** La Pouse, Oct 1975, *Coveny 7253* (NSW); c. 13 km WNW of Yalwal on road to Nowra, Oct 1990, *Henderson & Turpin H3427* (BRI); Green Cape, Oct 1961, *Phillips s.n.* (CANB [CBG001617]); Saltwater, near Wallabi Point, Dec 1987, *Dunn 144 & McMahon* (MEL, NSW). **Australian Capital Territory.** Jervis Bay road, near Caves Beach turnoff, Sep 1983, *Howe 55* (BRI). **Victoria.** Allen Head, Genoa River, Bottom Lake, Oct 1991, *Albrecht 4833* (BRI, MEL); c. 4 km SE of Dutson Downs, Oct 1986, *Corrick 9987 & Conn* (CANB, MEL); 4 miles [c. 6 km] direct line E of Frankston, Sep 1967, *Cullimore 81* (MEL); Holey Plains State Park, Nov 1991, *Fletcher 6* (MEL); Croajingalong N.P., c. 4 km direct NW of Mallacoota, near junction of Mallacoota and Korbethong roads, Sep 1994, *Lyne 1479* (CANB). **Tasmania.** 2.5 km N of Coles Bay on Swansea road, Feb 1983, *Forbes 1388* (CANB, HO, MEL); Waterhouse road, Oct 1981, *Morris 8172* (HO, MEL); Bridport, Oct 1981, *Morris 8186* (HO, MEL); Reeves Creek – Picnic Corner, Sep 1983, *Moscal 2683* (HO, MEL); Bay of Fires, Sep 1983, *Moscal 2802* (HO, MEL).

**Distribution and habitat:** *Ricinocarpus pinifolius* is widespread in coastal and near-coastal areas of eastern Australia from Whitsunday Island, Queensland, to the Otway region, Victoria, and in Tasmania from near Bridport and along the east coast to Coles

Bay with one record from Bruny Island (**Map 16**). It is recorded as growing on sandy soils mostly in heath, shrubland, woodland or open forest communities.

**Phenology:** Flowers have been collected throughout the year particularly from July to November, fruits throughout the year particularly from October to January.

**Affinities:** *Ricinocarpus pinifolius* is similar to *R. megalocarpus*, *R. ruminatus* Halford & R.J.F.Hend. and *R. tuberculatus*. It differs from *R. megalocarpus* and *R. tuberculatus* by its spiculate fruits. *Ricinocarpus pinifolius* also differs from *R. megalocarpus* in having proportionally narrower leaf blades. For features distinguishing *R. pinifolius* from *R. ruminatus*, refer to the 'Affinities' section under that species.

**Typification:** Desfontaines (1817), in his protologue of *R. pinifolius*, cited material collected from Port Jackson during the Baudin expedition ("Cet arbrisseau croit spontanément au Port Jackson, d'où les botanistes de l'expédition du capitaine Baudin en ont rapportés des rameaux conservés dans les herbiers du jardin du Roi"). Four sheets of apparently original material have been located amongst material on loan to BRI from P [152763, 152764, 152765, 152766]. All of this material agrees with the description in the protologue of *R. pinifolius*. The sheet numbered 152766 at P is here selected as the lectotype of *R. pinifolius*.

**Notes:** In regards to the type material of the name *Ricinocarpus megalanthus*, McGillivray (1973: 353) stated that "the original collection from which this material was taken is probably NSW90446, Nepean River, Forsyth 9.1898.". Chapman (1991: 2522) listed the NSW specimen NSW119054 as probable isotype of *R. megalanthus* but this is clearly an error here for he again cited this specimen as a possible isotype of *R. proximus* under that name, which accords more with McGillivray's comments on it.

McGillivray (1973: 353) indicated that the holotype of the name *Ricinocarpus proximus* is the specimen to the right on the LY sheet, the other not belonging to the type collection. He



also stated that NSW119054 is “a good match for the type” but failed to give details relative to it. It thus may or may not be an isotype of *R. proximus*.

**16. *Ricinocarpos psilocladus*** (Müll. Arg.) Benth., *Fl. Austral.* 6: 71 (1873) (*‘Ricinocarpus’*); *Bertya gummifera* var. *psiloclada* Müll. Arg., *Flora* 47: 471 (1864); *Roeperia psiloclada* (Müll. Arg.) Kuntze, *Revis. Gen. Pl.* 2: 619 (1891). **Type:** [Western Australia.] Swan River, *s.d.*, [J.] *Drummond n. 153* (holo: K [ex herb. Hook.]).

*Bertya psiloclada* (Müll. Arg.) Baill., *Adansonia* 6: 299 (1866), *nom. inval.*

Monoecious or dioecious, erect, open **shrubs** to 1.8 m high, resinous on young branchlets, inflorescences and leaves. Young branchlets subterete, sparsely tuberculate, reddish in colour, glabrous. Older branchlets with surface becoming tessellated, ± grey. **Leaves** petiolate, spirally alternate; petioles 1.5–3 mm long, glabrous; blades linear to narrow-oblong or very narrow-obovate, 20–40 mm long, (1.5–) 2.5–7 mm wide, with a length/width ratio of 5–12 (–18):1; adaxial surface glabrous, tuberculate; abaxial surface tomentose with soft white stellate hairs up to 0.4 mm across; base cuneate; margins recurved; apex obtuse to rounded; midvein impressed adaxially, abaxially raised and glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** of a single male or female flower, or ± umbelliform with either 2–5 male flowers or one female flower surrounded by up to 3 male flowers, terminal on branchlets or sometimes appearing axillary due to reduction of lateral branchlet; bracts and bracteoles narrow-ovate, 1–2 mm long, glabrous, resinous, caducous. **Flowers** conspicuous; pedicel glabrous, resinous; calyx 5-lobed; petals 5, *c.* twice as long as calyx. **Male flowers:** pedicel slender, 5–16 mm long; calyx glabrous abaxially and adaxially, resinous abaxially, lobes ovate or oblong-ovate, 3–4 mm long, 2–2.5 mm wide, obtuse or rounded at the apex; petals obovate, 6–9 mm long, 3.5–4 mm wide, white, glabrous, with margins entire, obtuse to rounded at the apex; disc of 5 discrete glands; glands 0.3–0.4 mm long, dorsi-ventrally compressed,

glabrous, truncate-sinuate distally; central column 2–3 mm long, glabrous; stamens 40–50; free portion of filaments 1–1.6 mm long, erect at anthesis, glabrous; anthers *c.* 0.5 mm long. **Female flowers:** pedicel stout, 6–15 mm long; calyx persistent, enlarging in fruit, glabrous abaxially and adaxially, resinous abaxially, lobes ovate, 3.4–4 mm long in flower (7–9 mm long in fruit), 1.8–2.1 mm wide in flower (5–6.5 mm wide in fruit), acute to obtuse at the apex; petals elliptic or obovate, 7–8.5 mm long, 2.5–4.5 mm wide, white, glabrous, with margins entire, rounded at the apex, marcescent; disc a glandular ring, 0.5–0.6 mm long, dorsi-ventrally compressed, glabrous, truncate distally; ovary ovoid but 3-sulcate, *c.* 1.5 mm long, glabrous, ± smooth; style ± obsolete; stigmatic limbs 1.5–2 mm long, glabrous; lobes spreading to ± upwardly curving, ± terete but grooved abaxially, smooth of both surfaces. **Fruits** ellipsoidal, 5–7 mm long, 6–7 mm across, glabrous, ± smooth, usually 3-seeded; calyx slightly longer than the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 4.7–5 mm long (including caruncle), 3.2–3.4 mm wide, 2.7–3 mm deep; testa brown to dark brown; caruncle ± reniform, *c.* 0.7 mm long, and 1.7 mm wide, ± smooth, creamy white.

**Additional selected specimens (from 28 examined):** **Western Australia.** Waggrakine cutting, Jul 1965, *Ashby 1494* (PERTH); Moresby Range, Howatharra, Jun 1966, *Burns 4* (PERTH); Burma road, 23 km N of Irwin River crossing, Jul 1986, *Corrick 9807* (MEL); 16 km S of Northampton, Aug 1985, *Demarz 10675* (PERTH); 32 km N of Geraldton on North West Coastal Highway, Aug 1983, *Dixon s.n.* (PERTH); Geraldton District, Northampton road, Jul 1964, *Galbraith WA116* (MEL); Mt Peron, Aug 1949, *Gardner 9407* (PERTH); 21 miles [*c.* 34 km] N of Geraldton, Sep 1966, *George 7943* (PERTH); *c.* 20 km S of Northampton, on road to Geraldton, Sep 1988, *Henderson H3149* (BRI); 37 km N of Geraldton, Aug 1976, *Hnatiuk 760374* (PERTH); Gardner Range, Coomallo District, Jul 1980, *Lievens s.n.* (PERTH); *c.* 15.4 km S of Northampton along North West Coastal Highway, Aug 1983, *Lynch 30* (PERTH); Howatharra Hill Reserve, Moresby Range, Jun 1974, *McFarland & McFarland 1036* (PERTH); Moresby Flat Top[ped] Range, 10 miles [*c.* 16 km] S of Northampton, Jul 1953, *Melville 4162 & Calaby* (CANB, K, PERTH); 20 miles [*c.* 32 km] N of Geraldton, Aug 1965, *Newbey 2187* (PERTH); 10 miles [*c.* 16 km] S of Northampton, Sep 1966, *Smith 66/401* (CANB, MEL, PERTH); Nanson to Howatharra road, 17 miles [*c.* 27 km] N of Geraldton, Jul 1995, *Smith 1760* (MEL).



**Distribution and habitat:** *Ricinocarpus psilocladus* is confined to south-western Western Australia in the Geraldton to Northampton area, with one collection of it from Mt Peron near Jurien (**Map 17**). It is recorded as growing mostly on rocky slopes on sandy to loam or gravelly soils in heath or shrubland communities.

**Phenology:** Flowers have been collected from May to September, fruits in August and September.

**Affinities:** *Ricinocarpus psilocladus* is similar to *R. graniticus* Halford & R.J.F.Hend. and *R. oliganthus* Halford & R.J.F.Hend. For features distinguishing *R. psilocladus* from these species, refer to the 'Affinities' section under the species concerned.

**17. *Ricinocarpus rosmarinifolius*** Benth., *Fl. Austral.* 6: 72/73 (1873); *Roeperia rosmarinifolia* (Benth.) Kuntze, *Revis. Gen. Pl.* 2: 619 (1891). **Type:** [Western Australia.] Montague Sound, September 1820, *A.Cunningham* 284 (lecto, [here chosen]: K; isolecto: BRI, CANB, K [ex herb. Hook.], MEL 2065959, PERTH).

**Illustration:** Wheeler (1992: 627, fig. 192c).

Monoecious, erect, slender, open **shrubs** to 2 m high. Young branchlets angular, with a moderately dense white indumentum, glabrescent; hairs stellate, sessile, multiangulate, <1 mm across. Older branchlets terete, with surface becoming striate, pale red-brown. **Leaves** petiolate, spirally alternate; petioles 1–3 mm long, densely hairy with hairs as for branchlets; blades linear or rarely very narrow-ovate, 30–80 (–110) mm long, 1.3–2 (–8) mm wide, with a length/width ratio of 26–40:1; adaxial surface glabrous except for scattered sessile stellate hairs especially along the midline, smooth; abaxial surface pubescent with soft white stellate hairs up to 0.3 mm across; base cuneate; margins recurved; apex acute or obtuse, occasionally ultimately mucronate with extension from midrib up to 0.1 mm long; midvein impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands present on blade, up to 2 mm from

base, 1 each side of midrib, sessile, smooth, c. 0.1 mm across. **Inflorescences** of a single male or female flower, or  $\pm$  umbelliform with either 2–4 male flowers or one female flower surrounded by up to 4 male flowers, terminal on branchlets but soon appears lateral as it is overtopped by growth of axillary buds; bracts and bracteoles linear, up to 4 mm long, densely stellate-pubescent adaxially and abaxially, caducous. **Flowers**  $\pm$  inconspicuous; pedicel white stellate-pubescent; calyx 5-lobed; petals 5, slightly shorter than calyx; disc a glandular ring. **Male flowers:** pedicel slender, c. 1 mm long; calyx white stellate-pubescent abaxially and adaxially, lobes ovate to broad-ovate, 1.5–2 mm long, 1.1–1.5 mm wide, rounded at the apex; petals broad-obovate, 1.5–2 mm long, 1–1.5 mm wide, of unknown colour when fresh, glabrous, with margins undulate, rounded at the apex; disc c. 0.4 mm long, dorsi-ventrally compressed, glabrous, irregularly lobed distally; central column 2–3 mm long, tomentose proximally; stamens c. 20; free portion of filaments 0.4–0.5 mm long, spreading at anthesis, glabrous; anthers c. 0.5 mm long. **Female flowers:** pedicel stout, 1.5–4 (–8) mm long; calyx persistent, indumentum as for calyx of male flowers, lobes oblong or triangular, 2–3 mm long, 0.8–1.3 mm wide, rounded at the apex; petals narrow-obovate or narrow-oblong, 1–1.5 mm long, 0.3–0.4 mm wide, of unknown colour when fresh, glabrous, with margins entire or few-notched, obtuse at the apex, caducous; disc as for male flowers; ovary ovoid, c. 1.5 mm long, densely stellate-pubescent; style 0.4–1 mm long, stellate-pubescent; stigmatic limbs 0.7–0.9 mm long, glabrous adaxially, stellate-pubescent proximally abaxially; lobes spreading to  $\pm$  downwardly curving,  $\pm$  terete, smooth on both surfaces. **Fruits** ellipsoidal, trilobate, 7.5–9 mm long, 5.5–6.8 mm across, sparsely stellate-pubescent with hairs up 0.3 mm across, usually 3-seeded; calyx  $\pm$  a quarter the length of mature fruit. **Seeds** ellipsoidal, dorsi-ventrally compressed, 5.7–6.7 mm long (including caruncle), 2.9–3.8 mm wide, 2.4–2.8 mm deep; testa pale to dark brown; caruncle  $\pm$  hemispherical, c. 1 mm long, 1.7–2.3 mm wide,  $\pm$  smooth, yellowish-white.

**Additional specimens examined:** Western Australia. Mitchell River, Feb 1980, *Dunlop 5236* (CANB, DNA, PERTH); peninsula NE of Frederick harbor at mouth of Hunter River, Jun 1985, *Fryxell 4883 et al.* (CANB); near Gariyeli Creek, Prince Regent River Reserve, Aug 1974, *George 12589* (CANB, PERTH); 1 km E of Mitchell Falls, May 1992, *Halford Q1428* (BRI, PERTH); 4.2 km SW of Anderdon, Jun 1987, *Kenneally 10406 & Hyland* (CANB, PERTH); Mitchell Falls, Mitchell Plateau, Jun 1976, *Kenneally 5007* (PERTH); c. 1 km E of Mitchell Falls, Mar 1994, *Mitchell 3372* (BRI, PERTH).

**Distribution and habitat:** *Ricinocarpus rosmarinifolius* is confined to the Kimberley region of Western Australia where it occurs from the Mitchell Plateau to the Prince Regent River area (**Map 18**). It is recorded as growing on sandy soil amongst sandstone boulders with *Triodia* sp. in open woodland.

**Phenology:** Flowers have been collected in February, May, June and August, fruits in March, May and June.

**Affinities:** *Ricinocarpus rosmarinifolius* is similar to *R. marginatus* and *R. trichophyllus*. It differs from *R. marginatus* in having linear or very narrow-ovate leaves. For features distinguishing *R. rosmarinifolius* from *R. trichophyllus*, refer to the 'Affinities' section under the latter species.

**Typification:** Bentham (1873) cited two collections in the protologue of *R. rosmarinifolius*, namely "Montague and York Sounds, N.W. coast, A. Cunningham". We have been unable to locate the collection from York Sound, but have located six sheets (two at K and one each at BRI, CANB, MEL and PERTH) of the *Cunningham* material from Montague Sound. All this material is believed to have been at Bentham's disposal when he described *R. rosmarinifolius*. The Kew sheet labelled "Montague Sound, 284/1820 Sept, N.W. Australia, A. Cunningham" is here selected as lectotype of Bentham's name as it is of ample proportions and agrees with his protologue.

**18. *Ricinocarpus ruminatus*** Halford & R.J.F.Hend. **species nova** ad *R. pinifolium* Desf. maxime affinis sed fructibus majoribus (14–16 mm longis × 14–16 mm latis non 8–12 mm longis × 10–14 mm latis) et seminibus majoribus (9.5–10 mm longis × 6–6.5 mm latis non 5.7–9 mm longis × 3.2–4.2 mm

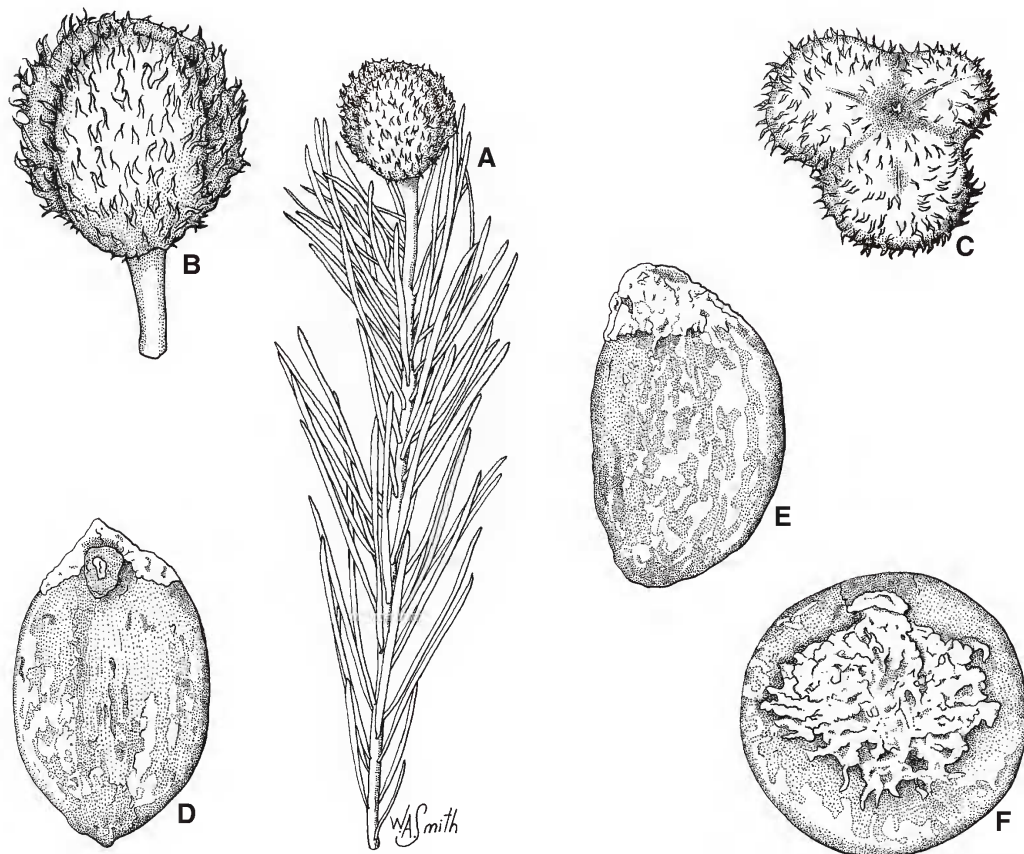
latis) ellipsoidalibus non ovoideis caruncula ruminata non plus minusve laevi facile distincta. **Typus:** Queensland. LEICHHARDT DISTRICT: Planet Downs, E of Rolleston, 16 October 1998, *A.R.Bean 14223* (holo: BRI).

*Ricinocarpus* sp. (Planet Downs A.R.Bean 14223), Forster & Halford (2002: 73; 2007: 72).

Monoecious, erect **shrubs** up to 2 m high. Young branchlets ± terete, glabrous. Older branchlets terete, with surface becoming longitudinally fissured, ± dark grey. **Leaves** petiolate, spirally alternate; petioles 1.5–2 mm long, glabrous; blades linear, 20–35 mm long, 0.7–1.3 mm wide, with a length/width ratio of 20–40:1; adaxial surface glabrous and smooth; abaxial surface puberulous with white stellate hairs up to 0.2 mm across; base cuneate; margins revolute to midrib; apex acute, ultimately mucronulate with excurrent midrib; mucro recurved; midvein obscure or slightly impressed adaxially, abaxially raised, glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** ± umbelliform with either 2–5 male flowers or one central female flower surrounded by up to 4 male flowers, terminal on branchlets; bracts caducous, not seen. **Flowers** conspicuous, pedicel glabrous; calyx 5 (rarely 4)-lobed; petals 5 (rarely 4), at least twice as long as calyx. **Male flowers** with pedicel slender, 12–40 mm long; calyx glabrous abaxially, moderately hairy with white crispate hairs adaxially, lobes ovate to broad-ovate, 1.3–1.8 mm long, 1.7–2 mm wide, obtuse at the apex; petals narrow-obovate, 10–13 mm long, 3–3.7 mm wide, white, glabrous except for tuft of hairs proximally on adaxial surface, margins entire, with apex rounded; disc of 5 discrete glands; glands c. 0.3 mm long, dorsi-ventrally compressed, glabrous, truncate to obtuse distally; central column c. 5 mm long, glabrous; stamens 20–30; free portion of filaments 0.8–2 mm long, ± erect at anthesis; anthers 0.6–0.8 mm long. **Female flowers** not seen; pedicel 10–15 mm long in fruit. **Fruits** subglobose, trilobate, 14–16 mm long, 14–16 mm across, glabrous, ± spiculate with subulate processes 2–4 mm long, very shortly beaked, usually 3-seeded. **Seeds**

ellipsoid, slightly compressed dorsally, 9.5–10 mm long (including caruncle), 6–6.5 mm wide, 5.8–6 mm deep, carunculate; testa pale to light brown with blotches of red-brown;

caruncle somewhat obliquely conical, c. 1.5 mm long and 4 mm wide, ruminant,  $\pm$  white. **Fig. 8.**



**Fig. 8.** *Ricinocarpus ruminatus*. A. fruiting branchlet  $\times 1$ . B. side view of fruit  $\times 2$ . C. face view of fruit  $\times 2$ . D. ventral view of seed  $\times 4$ . E. side view of seed  $\times 4$ . F. face view of caruncle  $\times 6$ . A–F from *Bean 14223* (BRI). Del. W.Smith.

**Additional specimens examined:** **Queensland.** LEICHHARDT DISTRICT: Planet Downs, Expedition Range E of Planet Creek, Oct 1999, *Halford Q3837* (BRI); Planet Downs, Nov 1984, *Kerswell 2* (BRI); Expedition Range, Planet Downs lease, c. 800m from Planet Creek, Aug 1999, *Schneider MS153 & Appelman* (BRI); mid way up Planet Creek, 'Planet Downs', Sep 1981, *Walsh s.n.* (BRI [AQ349537]).

**Distribution and habitat:** *Ricinocarpus ruminatus* is confined to central Queensland where it is known only from the Expedition Range, approximately 45 km east of Rolleston (**Map 19**). It is recorded as growing in open forest on sandy flats and in heathland on skeletal soil on rocky sandstone pavements and on hill tops.

**Phenology:** Flowers have been collected in August and December, fruits in May and September.

**Affinities:** *Ricinocarpus ruminatus* is similar to *R. pinifolius* but is easily distinguished from that species by its larger fruits (14–16 mm long  $\times$  14–16 mm across compared with 8–12 mm long  $\times$  10–14 mm across) with larger seeds (9.5–10 mm long  $\times$  6–6.5 mm across compared with 5.7–9 mm long  $\times$  3.2–4.2 mm across) that are ellipsoidal rather than ovoid and which have a ruminant rather than more or less smooth caruncle.



**Etymology:** The specific epithet is from Latin *ruminatus* (penetrated by irregular channels giving an eroded appearance), in reference to the texture of the caruncle on seeds of this species.

**19. *Ricinocarpus speciosus*** Müll.Arg., *Flora* 47: 470 (1864) (*'Ricinocarpus'*); *Roeperia speciosa* (Müll.Arg.) Kuntze, *Revis. Gen. Pl.* 2: 619 (1891). **Type:** [New South Wales.] Wilson River, Port Macquarie, in 1835, [*J. Backhouse s.n.* (holo: K [herb. ex Hook.]).]

**Illustration:** Elliot & Jones (2002: 238).

Monoecious or dioecious, slender, erect, open **shrubs** to 3 m high; shoot apices and flower buds with a ferruginous indumentum. Young branchlets terete, with a dense greyish-white indumentum; hairs stellate, sessile or shortly stipitate, multiangulate, < 0.8 mm across, with stipes < 0.3 mm long. Older branchlets with surface becoming longitudinally ridged, greyish in colour. **Leaves** petiolate, spirally alternate; petioles 4–10 mm long, densely hairy with hairs as for branchlets; blades narrow-elliptic or narrow-oblong, (40–) 50–90 (–120) mm long, 8–20 (–30) mm wide, with a length/width ratio of 4–8:1; adaxial surface stellate-pubescent when young but becoming glabrous except for scattered persistent hairs along the midline, smooth; abaxial surface tomentose with soft white stellate hairs up to 1 mm across; base cuneate to obtuse; margins slightly recurved; apex acute or obtuse; midvein impressed adaxially, abaxially raised and stellate-pubescent or glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent or occasionally present on blade, up to 3 mm from base, 1 each side of midrib, sessile or shortly stipitate, smooth, c. 0.1 mm across; stipes < 0.1 mm long. **Inflorescences** ± umbelliform with either 2–4 male flowers or 1–3 female flowers surrounded by up to 4 male flowers, terminal on branchlets; bracts and bracteoles linear, 3–6 mm long, glabrous or stellate-pubescent adaxially, stellate-pubescent abaxially, caducous. **Flowers** conspicuous; pedicel densely hairy with ferruginous stellate hairs; calyx 5-lobed; petals 5, c. twice as long as calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 10–25 mm long;

calyx densely tomentose with ferruginous stellate hairs abaxially, densely pubescent to tomentose with white stellate hairs adaxially, lobes ovate to semi-elliptic, 3.5–5 mm long, 2–3.5 mm wide, acute, obtuse or rounded at the apex; petals ovate or obovate, 7–9.5 mm long, 3–5.5 mm wide, white, glabrous, with margins few-notched, obtuse to rounded at the apex; disc-glands 0.4–0.7 mm long, dorsiventrally compressed, stellate-pubescent abaxially, glabrous adaxially, truncate-sinuate distally; central column 2.5–4 mm long, tomentose; stamens 40–50; free portion of filaments 1–2.5 mm long, erect to spreading at anthesis, glabrous; anthers c. 0.5 mm long. **Female flowers:** pedicel stout, 8–22 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes ovate, 4.5–6 mm long, c. 3 mm wide, acute at the apex; petals obovate, c. 9.5 mm long and 5 mm wide, white, glabrous, with margins entire, rounded at the apex, marcescent; disc-glands as for male flowers; ovary ovoid but 3-sulcate, c. 3.5 mm long, stellate-villose with reddish-brown hairs; style ± obsolete; stigmatic limbs 2.5–3.5 mm long, glabrous; lobes spreading to erect, ± dorsiventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** ellipsoidal, trilobate, 7–11 mm long, 8–11 mm across, stellate-tomentose, usually 3-seeded; calyx a quarter to half the length of mature fruit. **Seeds** ovoid or ellipsoid, dorsiventrally compressed, 5.5–5.8 mm long (including caruncle), 3–3.3 mm wide, 2.3–2.8 mm deep; testa brown; caruncle ± hemispherical, c. 1 mm long and 1.6 mm wide, ± smooth, yellowish-white.

**Additional selected specimens (from 41 examined):** **Queensland.** WIDE BAY DISTRICT: S.F. 959, Tewantin S.F., 300 m N of Gumboil road, Oct 1997, *Halford Q3422* & *Sharpe* (BRI, MEL); S.F. 997, Ringtail L.A., E of Pomona off Boreen–Tewantin road, Aug 1999, *Wang 2052* (BRI). MORETON DISTRICT: near Mons School road, Buderim, Aug 1995, *Bean 8800* (BRI); 1.2 km along Carricks road, Springbrook, Oct 1997, *Bean 12488* (MEL); Rocky Creek, Mt Barney N.P., Jul 1994, *Bean 7761* & *Halford* (BRI); Mt Ballow, Macpherson Range, Jul 1937, *Blake 13083* (BRI); Mt Mee S.F., Aug 1983, *Conran s.n.* (BRI [AQ478366]); Springbrook, Oct 1996, *Forster PIF19826* & *Leiper* (BRI, MEL); Mt Barney N.P., 200 m above Upper Portals, Jun 1989, *Halford Q1474* (BRI); Bull L.A., Mt Mee S.F., Sep 1989, *Henderson H3229* & *Guymer* (BRI); between Palmwoods and Landsborough, Jul 1930, *Hubbard 3415* (BRI, MEL);



Wilson road, Tanawah, Aug 1996, *Moran s.n.* (BRI [AQ750044]); Springbrook, near Wunburra Lookout on Advancetown–Springbrook road, Jul 1971, *Moriarty* 732 (CANB); Mt Mee S.F., 2 km NW of Forestry Station, Jul 1990, *Sked s.n.* (BRI [AQ504252]); Mt Edwards, Sep 1933, *Smith s.n.* (BRI [AQ205253]); Mt Ballow, Jul 1937, *White* 11097 (BRI), **New South Wales**. Orara S.F., 7 km SW of Nana Glen, Oct 1990, *Bean* 2464 (BRI); near Jirrah road crossing of Coldwater Creek, Bagawa S.F., c. 20 km NW of Coff's Harbour, Sep 1997, *Gilmour* 7848 (BRI); near the Dandahra Needles, Gibraltar Range, 68 km NE of Glen Innes via Gwydir Highway, Aug 1987, *Hind* 5248 & *D'Aubert* (BRI); Gibraltar Range, Dandahra Creek–Needles track, c. 2.5 km from camping area, Oct 1984, *Telford* 9872 & *Crisp* (CANB, MEL).

**Distribution and habitat:** *Ricinocarpos speciosus* occurs in south-eastern Queensland from Tewantin to Springbrook and in north-eastern New South Wales from the Gibraltar Range to the Port Macquarie area (**Map 20**). It is recorded as growing on slopes or on rocky creek banks mostly in wet sclerophyll forest often near rainforest margins.

**Phenology:** Flowers have been collected from June to October, fruits in September and October.

**Affinities:** *Ricinocarpos speciosus* is similar to *R. ledifolius* but differs from that species in having flowers with larger petals, larger fruits and generally larger leaves with longer petioles.

**20. *Ricinocarpos trachyphyllus*** Halford & R.J.F.Hend. **species nova** *R. bowmanii* F.Muell. et *R. linearifolio* Halford & R.J.F.Hend. maxime affinis. Ab illo foliorum lamina pagina abaxiali sericea non pubescenti et foliis plerumque proportione longioribus (folii lamina ratione longitudinis ad latitudinem 11–30 (–50):1 non 3–15:1) facile distincta. Ab hoc foliorum lamina pagina adaxiale scabra non levi et indumento villosa non tomentosa in pedicellis et calycum pagina adaxiali differt. **Typus:** Queensland. MARANO DISTRICT: 21.1 km W of 'Eulorel', W of Surat, 20 August 2001, *A.R.Bean* 17746 (holo: BRI; iso: MEL, NSW, distribuendi).

*Ricinocarpos* sp. (Westmar T.J.McDonald 263), Forster & Halford (2002: 73; 2007: 72).

Monoecious or apparently dioecious **shrubs** to 2 m high. Young branchlets terete, with a dense greyish-white indumentum; hairs stellate,

± sessile, multiangulate, < 0.4 mm across. Older branchlets shallowly longitudinally fissured, ± grey. **Leaves** petiolate, spirally alternate or occasionally subopposite; petioles 1–1.5 mm long, densely hairy with hairs as for branchlets; blades linear, 15–45 mm long, 0.9–1.2 mm wide, with a length/width ratio of 11–30 (–50):1; adaxial surface stellate-pubescent but becoming scabrid by the persistent tuberculate bases of deciduous hairs; abaxial surface sericeous with loosely appressed soft stellate hairs, up to 2 mm across; base cuneate or truncate; margins revolute to midrib; apex obtuse to rounded and gland-tipped; midvein obscure adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands present on blade, up to 1 mm from base, 1 per side of midrib, ± sessile or stipitate, smooth, c. 0.1 mm across; stipes up to 0.1 mm long. **Inflorescences** of a single male or female flower, or umbelliform with either 3 male flowers or one female flower surrounded by up to 3 male flowers, terminal on branchlets or sometimes appearing axillary due to reduction of lateral branchlet; bracts and bracteoles ovate to lanceolate, 3–8 mm long, glabrous adaxially, stellate-pubescent abaxially, caducous. **Flowers** conspicuous; pedicel shaggy villose with ferruginous stellate hairs; calyx 5-lobed; petals 5, slightly longer than calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 8–20 mm long; calyx shaggy villose with ferruginous stellate hair abaxially, white stellate-tomentose adaxially, lobes ovate, 4.5–5.5 mm long, 2.8–3.6 mm wide, acute at the apex; petals obovate, 7–12 mm long, 4.8–5.3 mm wide, white, glabrous, with margins entire, rounded or acute at the apex; disc-glands 0.5–0.8 mm long, dorsi-ventrally compressed, glabrous, rounded to truncate distally; central column 4–5 mm long, tomentose; stamens 30–50; free portion of filaments 1.8–2.5 mm long, erect to spreading or decurving at anthesis, glabrous; anthers 0.6–0.8 mm long. **Female flowers:** pedicel stout, 5–8 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes ovate, 5–6 mm long, 2.8–4 mm wide, acute at the apex; petals broad-obovate to obovate, 8–9 mm long, 5.5–6.5 mm wide, white, glabrous, with margins entire, obtuse

to rounded at the apex, marcescent; discoglands as for male flowers; ovary subglobose, 3-sulcate, 3.5–4.2 mm long, densely stellate-villose; style  $\pm$  obsolete; stigmatic limbs 2.8–4 mm long, glabrous adaxially, scattered stellate hairs proximally abaxially; lobes  $\pm$  spreading,  $\pm$  dorsi-ventrally compressed but shallowly grooved abaxially, verrucose adaxially,  $\pm$  smooth abaxially. **Fruits** subglobose or rarely ovoid, trilobate, 8–8.3 mm long, 8–9 mm across, stellate-villose, usually 3-seeded; calyx < half the length of mature fruit. **Seeds** ovoid, dorsi-ventrally compressed, c. 6.7 mm long (including caruncle), 3.6 mm wide and 2.7 mm deep; testa dark red-brown; caruncle  $\pm$  hemispherical, c. 0.8 mm long and 1.2 mm wide,  $\pm$  smooth, white. **Fig. 9.**

**Additional selected specimens (from 34 examined):** **Queensland.** WARREGO DISTRICT: 64 km SE of Charleville, Aug 1973, *Trapnell 267 & Williams* (BRI). MARANO DISTRICT: Thrushton N.P., Jul 1996, *Eddie 15* (BRI); 44 miles [c. 70 km] SSE of Charleville, Aug 1963, *Everist 7506* (BRI, MEL); c. 44 miles [c. 70 km] NE of St George, Aug 1956, *Everist 5830* (BRI); Boatman Station, Oct 1957, *Everist 5865* (BRI); Megine to Brucedale road c. 40 km due S of Roma, Sep 1995, *Grimshaw PG2177 & Bean* (BRI); 101 km from Charleville on road to Bollon via Boatman, Aug 1979, *McKenzie CT9* (BRI); 28 miles [c. 45 km] S of Roma, Sep 1967, *Pedley 2408* (BRI, MEL); 8 km SE of 'Calabah', Jun 1976, *Purdie 472D* (BRI); 75 km SE of Charleville, Sep 1983, *Silcock S653* (BRI). DARLING DOWNS DISTRICT: Moonie Highway, 16 miles [c. 26 km] from Westmar, Sep 1964, *Shoobridge s.n.* (CANB [CBG014317]); 22 km W of Westmar, Moonie Highway, Sep 1966, *McDonald 263* (BRI); 5 miles [c. 8 km] W of Westmar on Moonie Highway, Sep 1967, *McDonald 354* (BRI, NSW); 20 miles [c. 32 km] W of Westmar on Moonie Highway, Nov 1958, *Pedley 245A* (BRI); 23.6 km W of Westmar, Sep 1988, *Richardson 287 & Meredith* (BRI). **New South Wales.** Yathong Nature Reserve, 45 km N of Roto, Sep 1977, *Brickhill 603-10* (NSW); 'Kiaora', 75 km SW of Cobar, Sep 1978, *Green s.n.* (NSW); 'Buckambool', S of Cobar, Sep 1970, *Keane s.n.* (NSW); Matakana Bore, c. 1.5 km S of Matakana, Nov 1973, *Milthorpe & Cunningham 1305B* (NSW); 30 km E of Paddington, Aug 1974, *Pickhard s.n.* (NSW 464888); 'Bloomfield', track along southern boundary, Nov 1987, *Wilson 178 & Wilson* (BRI, NSW).

**Distribution and habitat:** *Ricinocarpus trachyphyllus* has a disjunct distribution. In southern Queensland, it occurs from Charleville eastwards to Westmar, near St George, and in western New South Wales from near Cobar southward to Matakana (near Lake Cargelligo) (**Map 21**). It is recorded as growing in open ironbark woodland or forest, mallee, and mulga and spinifex communities, on red sandy or sandy clay soils.

**Phenology:** Flowers have been collected in March and from June to November, fruits from September to November.

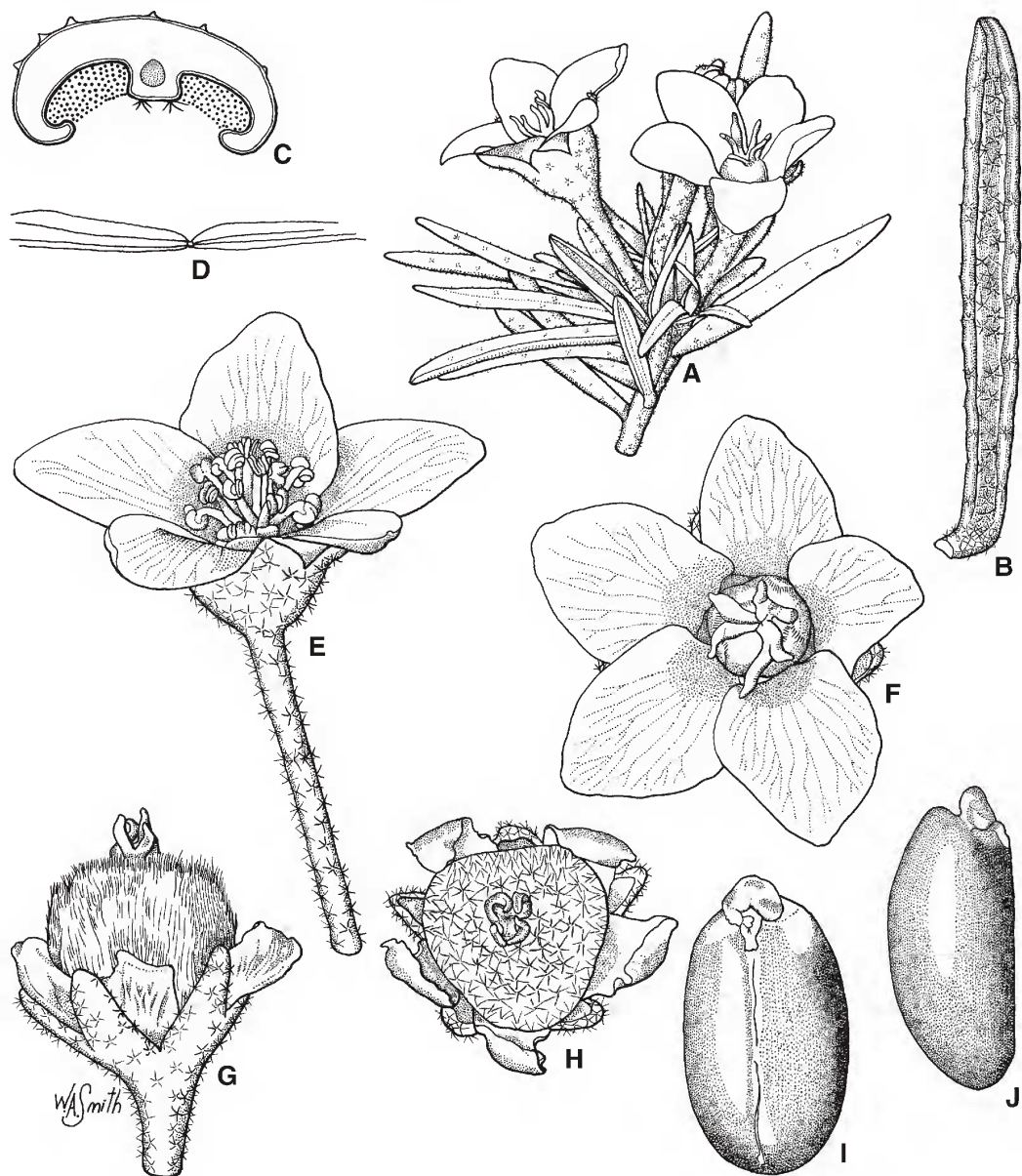
**Affinities:** *Ricinocarpus trachyphyllus* is similar to *R. bowmanii* and *R. linearifolius*. It is easily distinguished from *R. bowmanii* by its sericeous rather than pubescent indumentum on the abaxial surface of the leaf blades and its proportionally longer leaves (leaf blade length/width ratio of 11–30 (–50):1 compared with 3–15:1). It differs from *R. linearifolius* by its scabrous rather than smooth upper leaf blade surface and a shaggy villose rather than tomentose indumentum on pedicels and the adaxial surface of the calyces.

**Etymology:** The specific epithet is from Greek *trachys* (rough), and *-phyllus*, (leaved), and refers to the scabrid upper (adaxial) surface of leaf blades of this species.

**21. *Ricinocarpus trichophorus* Müll.Arg., *Linnaea* 34: 60/61 (1865) ('*Ricinocarpus*'); *Roepertia trichophora* (Müll.Arg.) Kuntze, *Revis. Gen. Pl.* 2: 619 (1891). **Type:** [Western Australia] ad Swan River, *s.d.*, *J. Drummond ser. 4 n. 219* (holo: ?G-BOISS *n.v.*; iso: K [two sheets one each ex herb. Benth. and herb. Hook.]).**

**Illustration:** Hopper *et al.* (1990: 76).

Monoecious, erect **shrubs** to 1.8 m high, shoot apices and flower buds with ferruginous indumentum. Young branchlets terete, with a dense grey-white indumentum; hairs stellate, sessile or shortly stipitate, multiangulate, < 1 mm across, with stipes < 0.2 mm long. Older branchlets with surface becoming ridged longitudinally, reddish-brown. **Leaves** sessile or shortly petiolate; spirally alternate; petioles up to 1 mm long, densely hairy with hairs as for branchlets; blades linear to narrow-oblong or rarely very narrow-ovate, 25–60 (–100) mm long, 1.5–4.5 (–10) mm wide, with a length/width ratio of 8–25 (–37):1; adaxial surface stellate-pubescent when young soon becoming glabrous and sparsely tuberculate with persistent bases of deciduous hairs; abaxial surface tomentose with soft white stellate hairs up to 1.7 mm across; base cuneate to obtuse; margins recurved usually so that only midrib of abaxial surface of leaf blade is visible; apex acute or obtuse, sometimes



**Fig. 9.** *Ricinocarpus trachyphyllus*. A. flowering branchlet  $\times 2$ . B. adaxial leaf surface showing indumentum  $\times 4$ . C. transverse section of leaf  $\times 18$ . D. stellate hair, from abaxial leaf surface  $\times 18$ . E. side view of male flower  $\times 4$ . F. face view of female flower  $\times 4$ . G. side view of fruit  $\times 3$ . H. face view of fruit  $\times 3$ . I. ventral view of seed  $\times 6$ . J. side view of seed  $\times 6$ . A–D, F–H from Halford Q8585A & Thomas (BRI); E from Halford Q8585B & Thomas (BRI); I, J from Milthorpe 1305B & Cunningham (NSW). Del. W.Smith.

with sessile gland at tip; midvein impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands absent or present on blade, up to 30 mm from base, 1 or 2 each side of midrib, sessile or stipitate,

smooth, c. 0.3 mm across; stipes up to 0.4 mm long. **Inflorescences** racemose with one or two female flowers basal on the axis with up to 5 male flowers distal to them, terminal on branchlets, frondobracteose; rachis 2–4 cm long; bracts lanceolate, 4–9 mm long, densely



stellate-pubescent adaxially and abaxially. **Flowers** conspicuous; pedicel densely hairy with ferruginous stellate hairs; calyx 5-lobed; petals 5, *c.* twice as long as calyx. **Male flowers:** pedicel slender, 5–10 mm long; calyx densely tomentose with ferruginous and white stellate hairs abaxially, densely tomentose adaxially with white stellate hairs, lobes narrow-ovate, 4–5.5 mm long, 1.5–2.5 mm wide, acute to shortly acuminate at the apex; petals broad-ovate to obovate, 8–10 mm long, 3.5–5 mm wide, white, glabrous except for tuft of white simple hairs proximally on adaxial surface, with margins undulate, rounded at the apex; disc of 5 discrete glands; glands 0.4–0.6 mm long, dorsi-ventrally compressed, glabrous, sometimes irregularly lobed, rounded to truncate distally; central column 3–4.5 mm long, tomentose; stamens 50–60; free portion of filaments 1–1.5 mm long, erect to spreading at anthesis, glabrous or with scattered hairs; anthers *c.* 0.5 mm long. **Female flowers:** pedicel stout, 4–10 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes ovate, 4–7 mm long, 1.5–2.5 mm wide, acute to acuminate at the apex; petals narrow-obovate, 8–9 mm long, 1.5–2.5 mm wide, white, sparsely stellate-pubescent proximally abaxially, stellate-tomentose for most of its length adaxially, with margins entire, obtuse at the apex, marcescent; disc a glandular ring, *c.* 0.2 mm long, dorsi-ventrally compressed, glabrous, truncate distally; ovary subglobose, 2.5–3.5 mm long, densely stellate-villose; style *c.* 0.3 mm long, glabrous; stigmatic limbs 3–3.5 mm long, glabrous; lobes  $\pm$  spreading,  $\pm$  dorsi-ventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** ellipsoidal, 8–10 mm long, 7–10 mm across, stellate-tomentose, usually 3-seeded; calyx *c.* half the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, *c.* 6.5 mm long (including caruncle), 3.5 mm wide, and 2.8 mm deep; testa red-brown and blotched with dark brown; caruncle  $\pm$  conical, *c.* 0.8 mm long, and 1 mm wide,  $\pm$  wrinkled, yellowish-white.

**Additional specimens examined:** Western Australia. Mt Heywood, Jan 1992, *Archer 101927* (MEL); Mt Heywood, 82 km NE of Esperance, Oct 1995, *Archer 210956* (MEL); Mt Beaumont, Aug 1983, *Burgman*

*MABI739* (PERTH); Mt Heywood, Sep 1983, *Burgman & McNee 2486* (PERTH); Mt Heywood, Aug 1980, *Clements 1827* (CANB); Gorge of Fitzgerald River, Sep 1948, *Gardner 9240* (PERTH); Fitzgerald River, May 1964, *Gardner 14767* (PERTH); N side of Mt Heyward [Heywood], Aug 1980, *George 15867* (PERTH); Tweetup [Twertup] Creek, Mar 1965, *Newbey 1754* (PERTH).

**Distribution and habitat:** *Ricinocarpus trichophorus* is confined to the south coast of Western Australia where it is known from around Fitzgerald River and Twertup Creek, south west of Ravensthorpe, and Mt Heywood and Mt Beaumont NE of Esperance (**Map 22**). It is recorded as growing in shrubland communities on sandy soils on slopes amongst sandstone or granite boulders.

**Phenology:** Flowers have been collected in January, March, May and from August to November, fruits in March, September and October.

**Affinities:** *Ricinocarpus trichophorus* is similar to *R. velutinus* but differs from that species in having young shoots and inflorescence with a ferruginous indumentum, adaxial surface of leaf blades stellate-pubescent when young soon becoming glabrous and flowers with white petals.

**22. *Ricinocarpus trichophyllus*** Halford & R.J.F.Hend. **species nova** *R. marginatum* F.Muell. et *R. rosmarinifolio* Benth. maxime affinis. Ab illo foliorum lamina minore lineari usque ad angusto-oblonga non angusto-elliptica (22–45 mm longa  $\times$  1.4–3.5 (–6) mm lata non 45–90 mm longa  $\times$  8–20 mm lata) facile distincta. Ab hoc indumento in ramulis generatim plus grosso, foliorum lamina pagina adaxiali stellato-pubescenti non plus minusve glabra, floribus femineis calycis lobis lato-ovatis non angusto-triangularibus vel oblongis et ovario et fructu indumento densissimo pilis stellatis (pili minores quam 0.1 mm diam. non usque ad 0.3 mm diam.) differt. **Typus:** Northern Territory. VICTORIA RIVER REGION: Spirit Hills Conservation area, S of Nancy's Gorge, 20 August 1996, *I.Cowie 7144* (holo: BRI; iso: MEL [and according to label with holotype, DNA, CANB, AD, NSW, PERTH]).

*Ricinocarpus* sp. A., Wheeler (1992: 626).

*Ricinocarpus* sp. A. Kimberley Flora (A.S.George 14118), Paczkowska & Chapman (2000: 249).

Monoecious, open, slender **shrubs** 0.7–1.5 m high. Younger branchlets  $\pm$  terete, with a moderately dense white indumentum; hairs stellate,  $\pm$  sessile, multiangulate, 0.3–0.6 mm across. Older branchlets with surface becoming shallowly, longitudinally fissured, greyish-white. **Leaves** petiolate, spirally alternate; petioles 1.5–2 mm long, densely hairy with hairs as for branchlets; blades linear to narrow-oblong, 22–45 mm long, 1.4–3.5 (–6) mm wide, with a length/width ratio of 8–25:1; adaxial and abaxial surfaces moderately dense to densely pubescent with stipitate stellate hairs 0.2–0.4 mm across; base cuneate; margins recurved to revolute; apex obtuse to acute, occasionally ultimately apiculate with extension from midrib up to 0.1 mm long; midvein slightly impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands absent or present on blade, up to 1 mm from base, 1 per side of midrib, sessile, smooth, 0.1–0.2 mm across. **Inflorescences**  $\pm$  umbelliform usually of one female flower surrounded by 2 or 3 male flowers, initially terminal on branchlets but soon appears lateral as it is overtopped by growth of axillary buds; bracts and bracteoles linear, 1–1.5 mm long, stellate-pubescent, caducous. **Flowers** inconspicuous; pedicel white stellate-pubescent; calyx 5-lobed; petals 5,  $\pm$  equalling or shorter than calyx; disc a glandular ring. **Male flowers**: pedicel slender, 2.5–10 mm long; calyx white stellate-pubescent abaxially,  $\pm$  glabrous adaxially, lobes ovate to elliptic, 3–3.5 mm long, 2–2.5 mm wide, obtuse at the apex; petals broad-obovate, 1.9–3 mm long, 1.2–2.2 mm wide, of unknown colour when fresh, glabrous, with margins undulate,  $\pm$  truncate at the apex; disc c. 0.2 mm long, dorsi-ventrally compressed, glabrous, lobed distally; lobes truncate to obtuse; central column c. 3.5 mm long, glabrous except for scattered stellate hairs proximally; stamens c. 25; free portion of filaments 2–2.5 mm long,  $\pm$  erect at anthesis, glabrous; anthers 0.5–0.6 mm long. **Female**

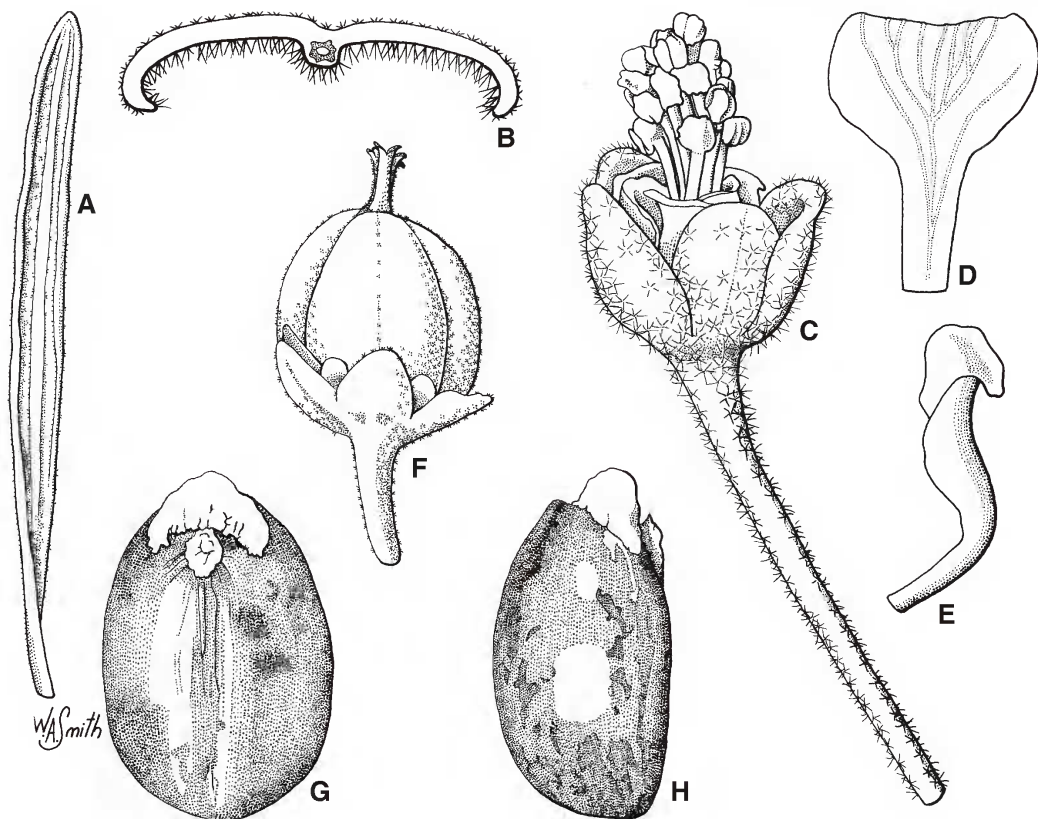
**flowers**: pedicel stout, 4–7 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes broad-ovate, 2.7–3 mm long, 2.2–2.6 mm wide, obtuse at the apex; petals spatulate, 2.3–2.5 mm long, 1–1.3 mm wide, of unknown colour when fresh, glabrous, with margins undulate, rounded at the apex, marcescent; disc as for male flowers; ovary subglobose, c. 2.5 mm long, densely stellate-pubescent; style 1.5–2 mm long, densely stellate-pubescent; stigmatic limbs of unknown colour when fresh, 1.3–1.5 mm long, glabrous adaxially, stellate-pubescent proximally abaxially; lobes strongly revolute,  $\pm$  terete but grooved abaxially,  $\pm$  verrucose adaxially, smooth abaxially. **Fruits** subglobose, trilobate, 6–8 mm long, 7.5–8 mm across, very densely stellate-pubescent with hairs up to 0.1 mm across, usually 3-seeded; calyx c. a third the length of mature fruit. **Seeds** ovoid, dorsi-ventrally compressed, c. 7 mm long (including caruncle), 4.5 mm wide and 3.5 mm deep; testa red-brown; caruncle  $\pm$  reniform or pyramidal, c. 1 mm long and 2 mm wide,  $\pm$  smooth, creamy-white or pale green. **Fig. 10.**

**Additional specimens examined:** **Western Australia.** near Solea Fall, Drysdale River, Drysdale River N.P., Aug 1975, *George 13757* (CANB, PERTH); Planigale Creek, Drysdale River N.P., Aug 1975, *Kenneally 4460* (PERTH). **Northern Territory.** Moyle River, May 1994, *Dunlop 9831 & Latz* (BRI, MEL); Bradshaw Station, Feb 1999, *Michell & Yates 2130* (DNA); Spirit Hills, Nancy's Gorge, Aug 1996, *Michell 258* (DNA).

**Distribution and habitat:** *Ricinocarpus trichophyllus* is confined to Drysdale River N.P., Kimberley, Western Australia and the Moyle and Victoria River areas of the Northern Territory (**Map 23**). It is recorded as growing in shrubland and eucalypt woodland communities on sandy soils associated with sandstone outcrops.

**Phenology:** Flowers and fruits have been collected in February, May and August.

**Affinities:** *Ricinocarpus trichophyllus* is similar to *R. marginatus* and *R. rosmarinifolius*. It is easily distinguished from *R. marginatus* by its smaller, linear to narrow-oblong rather than narrow-elliptic leaf blades (22–45 mm long  $\times$  1.4–3.5 (–6) mm wide compared with 45–90 mm long  $\times$  8–20 mm wide in *R. marginatus*).



**Fig. 10.** *Ricinocarpus trichophyllus*. A. adaxial leaf surface  $\times 4$ . B. transverse section of leaf  $\times 16$ . C. side view of male flower  $\times 8$ . D. adaxial view of petal from male flower  $\times 16$ . E. side view of petal from male flower  $\times 16$ . F. side view of fruit  $\times 4$ . G. ventral view of seed  $\times 6$ . H. side view of seed  $\times 6$ . A–E from Cowie 7144 (BRI); F from Michell 258 (DNA); G, H from Michell 2130 & Yates (DNA). Del. W.Smith.

It differs from *R. rosmarinifolius* in its generally coarser indumentum on branchlets, its stellate-pubescent rather than  $\pm$  glabrous adaxial surface of leaf blades, its broad-ovate rather than narrow-triangular or oblong calyx lobes in female flowers and the very dense indumentum of minute stellate hairs on its ovary and fruit (hairs less than 0.1 mm across compared with up to 0.3 mm across in *R. rosmarinifolius*).

**Etymology:** The specific epithet is derived from Greek *tricho-* (hairy), and *-phyllus* (leaved), in reference to the persistent stellate indumentum on the upper surface of leaf blades in this species.

**23. *Ricinocarpus tuberculatus*** Müll.Arg., *Linnaea* 34: 60 (1865) ('*Ricinocarpus*'); *Roeperia tuberculata* (Müll.Arg.) Kuntze,

*Revis. Gen. Pl.* 2: 619 (1891). **Type:** [Western Australia] ad Swan River, *s.d.*, *J.Drummond ser. 4 n. 84* (holo: ?G-BOISS *n.v.*; iso: K).

**Illustration:** Elliot & Jones (2002: 239).

Monoecious or dioecious, erect **shrubs or small trees** to 4 m high. Young branchlets subterete, glabrous,  $\pm$ glaucous. Older branchlets with surface becoming shallowly longitudinally fissured and flaky,  $\pm$  grey. **Leaves** petiolate, spirally alternate; petioles 1–3 mm long, glabrous; blades linear, 10–25 mm long, 0.8–1.3 mm wide, with a length/width ratio of 15–20:1; adaxial surface glabrous,  $\pm$  smooth; abaxial surface puberulous with soft white crispate hairs up to 0.4 mm long; base cuneate; margins recurved to midrib so that only midrib of abaxial surface of leaf blade is visible; apex obtuse to acute, ultimately



mucronate with extension from midrib; mucro straight or slightly downwardly curved, up to 0.4 mm long; midvein obscure adaxially, abaxially raised and glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** ± umbelliform with either 2–7 male flowers or one central female flower surrounded by up to 5 male flowers, terminal on branchlets; bracts linear, 5–6 mm long, glabrous, caducous; bracteoles absent or when present, linear, 1–2 mm long, glabrous. **Flowers** conspicuous; pedicel glabrous; calyx 5-lobed; petals 5, *c.* four times as long as calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 12–22 mm long; calyx glabrous abaxially, moderately hairy with white crispate hairs adaxially, lobes triangular, 1.5–2.5 mm long, 1–1.5 mm wide, acute at the apex; petals narrow-obovate, 10–12 mm long, 2.5–4 mm wide, white, glabrous except for tuft of white simple hairs proximally on adaxial surface, with margins entire, obtuse at the apex; disc-glands 0.3–0.4 mm long, dorsi-ventrally compressed, glabrous, rounded distally; central column *c.* 4 mm long, pubescent; stamens *c.* 30; free portion of filaments 0.3–0.6 mm long, ± erect at anthesis, glabrous; anthers *c.* 0.5 mm long. **Female flowers:** pedicel usually stout, 5–10 mm long; calyx caducous, indumentum as for calyx of male flowers, lobes triangular, 1.2–2.2 mm long, 0.8–1 mm wide, acute at the apex; petals narrow-obovate, 10–12 mm long, 3–4 mm wide, white, glabrous except of tuft of appressed white simple hairs proximally on adaxial surface, with margins entire, rounded at the apex, caducous; disc-glands as for male flowers; ovary ovoid, *c.* 2 mm long, glabrous, verrucose; style ± obsolete; stigmatic limbs 2–2.5 mm long, glabrous; lobes spreading, ± dorsi-ventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** ellipsoidal, 10–12 mm long, 7–8 mm across, glabrous, ± smooth, usually 3-seeded. **Seeds** ovoid, dorsi-ventrally compressed, 7–8 mm long (including caruncle), 3.5–3.7 mm wide, 2.5–2.7 mm deep; testa pale brown and blotched with dark brown; caruncle ± concial, *c.* 1.7 mm long and 2 mm wide, ± smooth, yellowish-white.

*Additional selected specimens (from 15 examined):*  
**Western Australia.** between Bruce Rock and

Narembeen, S of Merredin, Sep 1929, *Blackall s.n.* (PERTH); Kokerbin Hill, Oct 1983, *Cranfield 4854* (PERTH); Mt Caroline, S of Kellerberrin, Jan 1940, *Gardner s.n.* (PERTH); SE foothills of Mt Caroline, *c.* 19 km SSW of Kellerberrin, Sep 1988, *Henderson H3160* (BRI); Mt Caroline, SW of Kellerberrin, Oct 1963, *Jefferies 631001* (PERTH); Wildlife Reserve, 21 km SSE of Kellerberrin, Apr 1986, *Neden 4* (CANB); Mt Stirling, Oct 1964, *Newbey 1572* (PERTH); Nangeen Hill, Bruce Rock Shire, Jul 1980, *Williams 10* (PERTH).

**Distribution and habitat:** *Ricinocarpus tuberculatus* is confined to south-western Western Australia where it is restricted to the Kellerberrin–Bruce Rock area (**Map 24**). It is recorded as growing in shrubland communities on shallow sandy soils on hill slopes amongst granite rocks boulders.

**Phenology:** Flowers have been collected in January, March, April, July and from September to November, fruits in January, July and from October to November.

**Affinities:** *Ricinocarpus tuberculatus* is similar to *R. cyanescens* and *R. megalocarpus*. It differs from *R. cyanescens* in having generally longer leaves, 3-seeded fruits and a more or less smooth fruit surface. For features distinguishing *R. tuberculatus* from *R. megalocarpus*, refer to the ‘Affinities’ section under that species.

**24. *Ricinocarpus undulatus*** Lehm., *Pl. Preiss.* 2: 370 (1848) (*‘Ricinocarpus’*); *Ricinocarpus glaucus* var. *undulatus* (Lehm.) Müll.Arg. in A.DC., *Prodr.* 15(2): 205 (‘late Aug’ 1866) (*‘Ricinocarpus’*). **Type:** [Western Australia] “In regionibus interioribus Australiae meridionali-occidentalis, m. Nov. 1810 Herb. Preiss. N. 2016 ex parte” (holo: ?, *n.v.*; iso: MEL 2065946 [ex herb. Sonder]; MEL 2062905 [ex herb. Sonder]; MEL 2066079; G-DC, *n.v.* [microfiche IDC 800-73. 2455: II. 3]).

Monoecious or apparently dioecious, erect spindly **shrubs** to 1.5 m high. Young branchlets subterete, moderately to densely hairy in two longitudinal bands; hairs simple, erect, up to 0.2 mm long. Older branchlets with surface becoming shallowly longitudinally fissured and flaky, greyish-white. **Leaves** petiolate, spirally alternate or occasionally subopposite; petioles 0.5–2 mm long, densely hairy adaxially with ± appressed simple hairs

up to 0.4 mm long, glabrous abaxially; blades linear, (5–) 13–35 mm long, (1–) 1.3–3 mm wide, with a length/width ratio of 7–20:1; adaxial surface glabrous, smooth; abaxial surface sericeous with loosely appressed soft straight hairs up to 2.3 mm long; base cuneate; margins recurved usually to midrib; apex obtuse to acute, ultimately mucronate with extension from midrib; mucro straight or slightly upwardly curved, up to 0.5 mm long; midvein slightly impressed adaxially, abaxially raised and glabrous on abaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** of a single male or female flower, or  $\pm$  umbelliform mostly with either 2–5 male flowers or one female flower surrounded by up to 3 male flowers, terminal on branchlets or sometimes appearing axillary due to reduction of lateral branchlet; bracts and bracteoles narrow-ovate, 2–4 mm long, stellate-pubescent on adaxial surface and on margins, glabrous abaxially, caducous. **Flowers** conspicuous, fragrant; pedicel glabrous; calyx 5-lobed; petals 5 (rarely 6), *c.* five times as long as calyx; disc of 5 (rarely 6) discrete glands. **Male flowers:** pedicel slender, 10–25 mm long; calyx glabrous abaxially, densely hairy with simple white hairs adaxially, lobes triangular or ovate, 2–3 mm long, 1.3–1.6 mm wide, acute or obtuse at the apex; petals narrow-obovate or oblong-obovate, 7–15 mm long, 2.2–4.5 mm wide, white adaxially, white with blushes of pink or maroon abaxially, glabrous except for tuft of white simple hairs proximally on adaxial surface, with margins entire, acute to obtuse at the apex; disc-glands *c.* 0.8 mm long, slightly dorsi-ventrally compressed, hairy adaxially with  $\pm$  erect simple hairs *c.* 0.3 mm long, glabrous abaxially, rounded to truncate distally; central column 2–4 mm long, glabrous; stamens 15–25; free portion of filaments 0.6–1 mm long, erect to spreading at anthesis, glabrous; anthers *c.* 0.5 mm long. **Female flowers:** pedicel slender, 5–25 mm long; calyx persistent, indumentum as for calyx of male flowers, lobes triangular or ovate, 2.3–3.2 mm long, 1.5–1.7 mm wide, acute at the apex; petals narrow-obovate, 8–12 mm long, 2.7–3.8 mm wide, white adaxially, white with shades of pink or maroon abaxially, glabrous except for tuft of white simple hairs

proximally on adaxial surface, with margins entire, obtuse at the apex, caducous; disc-glands as for male flowers; ovary ovoid but trilobate, 2–2.7 mm long, glabrous, smooth; style *c.* 0.4 mm long, glabrous; stigmatic limbs 2–2.7 mm long, glabrous; lobes spreading to ascending,  $\pm$  terete but grooved proximally abaxially, smooth on both surfaces. **Fruits** ellipsoidal, trilobate, 8–10 mm long, 6–7.5 mm across, glabrous,  $\pm$  smooth, usually 3-seeded; calyx *c.* a fifth the length of mature fruit. **Seeds** ellipsoid, slightly dorsi-ventrally compressed, 5–6 mm long (including caruncle), 3.7–3.8 mm wide, 3–3.4 mm deep; testa pale brown and blotched with dark brown; caruncle  $\pm$  hemispherical, 1.3–1.5 mm long, 1.8–1.9 mm wide,  $\pm$  smooth, yellowish-white.

**Additional selected specimens (from 57 examined):**

**Western Australia.** Yerramullah track on the W edge of Badgingarra N.P., *c.* 4 km WSW of High Hill, Sep 1990, *Albrecht 4418 & Führer* (MEL); Wanneroo, Aug 1959, *Aplin s.n.* (PERTH); Badgingarra, Sep 1969, *Ashby 3042* (CANB, PERTH); N of Wubin, Sep 1970, *Ashby 3617* (PERTH); Lake Grace, Oct 1962, *Cough 40* (PERTH); Balga, Sep 1971, *Demarz D.3413* (PERTH); S side of Mullaloo Drive, 1 mile [*c.* 1.6 km] E of Marmion ave, Craigie, Oct 1975, *George 5* (PERTH); S of Jurien road, 3.5 km W of Brand Highway, Oct 1979, *Griffin 2410* (PERTH); 20 km SSE of Lancelin on Wanneroo road, Aug 1979, *Haegi 1897* (PERTH); 11.7 km E of Green Head on road to Brand Highway, Sep 1979, *Haegi 1916* (PERTH); crest of ridge *c.* 1 km S of Ballidu, on road to Wongan Hills, Sep 1988, *Henderson H3156* (BRI); *c.* 5 km NE of Jurien, on road to Brand Highway, Sep 1988, *Henderson H3137* (BRI); *c.* 21 km SE of Lancelin, on road to Gingin, Sep 1988, *Henderson H3133* (BRI); 8 km E of Jurien Bay, Sep 1978, *Hnatiuk 780123* (PERTH); 11.5 km E of Jurien, Sep 1976, *Johnson 3246* (BRI); 5 miles [*c.* 8 km] N of Maya, Aug 1965, *Newbey 2082* (PERTH); 17 km W of York, Wambyn road at 850 m S of junction with Boyercutty road, Sep 1983, *Patrick 32* (PERTH); SW of Ballidu on catchment to town dam, Sep 1988, *Smith 1074* (BRI, MEL); New Geraldton road [Brand Highway], 2 miles [*c.* 3 km] N of the Watheroo–Jurien Bay crossroad, Sep 1966, *Smith 66/211* (PERTH, MEL); Lackman Dam, N of Korrelocking, Aug 1983, *Smith 256* (CANB, MEL).

**Distribution and habitat:** *Ricinocarpos undulatus* is confined to south-western Western Australia where it occurs from near Green Head and Wubin southwards to Fremantle and east to Merredin and Lake Grace (**Map 25**). It has been recorded once in the Busselton region (*Stoward s.n.*, in 1916 (PERTH)). It is recorded as growing in heath, shrubland, mallee and open woodland

communities on a variety of sandy soils, either deep or shallow, over laterite or limestone.

**Phenology:** Flowers have been collected from July to September, fruits from September to November.

**Affinities:** *Ricinocarpus undulatus* is similar to *R. glaucus* and *R. pilifer*. It differs from *R. glaucus* in having a sericeous indumentum with loosely appressed soft straight hairs on the abaxial surface of leaf blades and flowers with petals that are white adaxially and shades of pink or maroon abaxially. For features distinguishing *R. undulatus* from *R. pilifer*, refer to the 'Affinities' section under the latter species.

**Notes:** The combination *Ricinocarpus glaucus* var. *undulatus* was made independently by H. Baillon on or after 30 Aug 1866 (Henderson 1992). Thus, it is debatable who should be credited with first making it. We have assumed that it is more likely Müller's combination predates that of Baillon.

**25. *Ricinocarpus velutinus*** F.Muell., *Fragm.* 9: 2 (1875) ('*Ricinocarpus*'); *Roeperia velutina* (F.Muell.) Kuntze, *Revis. Gen. Pl.* 2: 619 (1891). **Type:** [Western Australia] Upper Irwin River, *s.d.*, *J. Forrest s.n.* (lecto [here chosen]: MEL 90951; isolecto: K, MEL 90950).

*Plagianthus monoicus* Ewart in Ewart & Tovey, *Proc. Roy. Soc. Victoria* 32: 203 (1920) ('*P. monoica*'). **Type:** Western Australia. near Lake Deborah, 25 November 1891, *R. Helms s.n.* (holo: MEL 90953; iso: MEL 90952, AD 96628004 and 97714338 *n.v.*).

**Illustration:** Corrick & Führer (1996: 55).

Monoecious or rarely dioecious, dense erect **shrubs** to 2 m high. Young branchlets terete, with a dense white indumentum; hairs stellate, sessile or shortly stipitate, multiangulate, < 0.8 mm across, with stipes < 0.2 mm long. Older branchlets with surface becoming longitudinally ridged, reddish-brown. **Leaves** sessile or shortly petiolate, spirally alternate; petioles up to 1 mm long, densely hairy with hairs as for branchlets; blades linear or rarely narrow-oblong, (12–) 25–55 (–60) mm long, 1.5–4 (–7) mm wide, with a length/width

ratio of 8–20:1; adaxial surface and abaxial surface tomentose with soft white stellate hairs up to 0.8 mm across; base cuneate to obtuse; margins recurved; apex acute or obtuse, sometimes with stipitate gland at tip; midvein impressed adaxially, abaxially raised and stellate-pubescent; secondary venation obscure on both surfaces; marginal glands absent or occasionally present on blade, up to 30 mm from base, 1 or 2 each side of midrib, stipitate, smooth, *c.* 0.3 mm across; stipes up to 0.1 mm long. **Inflorescences** racemose with all female or all male flowers or one or two female flowers basal on the axis with up to 13 male flowers distal to them, terminal on branchlets, frondobracteose; rachis 3–6 cm long; bracts linear, 3–10 mm long, densely stellate-pubescent adaxially and abaxially; bracteoles absent. **Flowers** conspicuous; pedicel densely hairy with white stellate hairs; calyx 5-lobed; petals 5, slightly longer than calyx; disc of 5 discrete glands. **Male flowers:** pedicel slender, 4–11 mm long; calyx densely tomentose with white stellate hairs abaxially and adaxially, lobes narrow-ovate to ovate, 4–7 mm long, 2–3 mm wide, acuminate at the apex; petals obovate, 6.5–8.5 mm long, 3–4 mm wide, yellow, glabrous except for tuft of woolly hairs proximally on adaxial surface, with margins entire, rounded at the apex; disc-glands 0.6–0.8 mm long, dorsi-ventrally compressed, sinuate, glabrous, irregularly lobed distally; central column *c.* 4 mm long, tomentose; stamens 40–70; free portion of filaments 1.8–3 mm long, erect to spreading at anthesis, glabrous; anthers *c.* 0.8 mm long. **Female flowers:** with pedicel stout, 5–15 mm long; calyx persistent, enlarging in fruit, indumentum as for calyx of male flowers, lobes ovate, 8–10 mm long in flower (9–20 mm long in fruit), 4–5 mm wide in flower (6–7 mm wide in fruit), acuminate at the apex; petals narrow-oblong, *c.* 7 mm long, and 2 mm wide, yellow, tomentose proximally on adaxial and abaxial surfaces, with margins entire, rounded or acute at the apex, marcescent; disc-glands *c.* 0.4 mm long, dorsi-ventrally compressed, glabrous or with scattered stellate hairs, truncate distally; ovary globose, *c.* 3 mm long, densely stellate-villose; style *c.* 0.4 mm long, stellate-pubescent; stigmatic limbs *c.* 6 mm long, glabrous adaxially, scattered stellate



hairs proximally abaxially; lobes spreading,  $\pm$  dorsi-ventrally compressed or  $\pm$  terete but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** ellipsoidal, 9–10 mm long, 9–12 mm across, stellate-villose, usually 3-seeded; calyx equal to or slightly longer than the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 5.5–6 mm long (including caruncle), 3.2–3.7 mm wide, 2.6–3 mm deep; testa dark brown or greyish-white and blotched with dark reddish-brown; caruncle  $\pm$  conical, c. 1 mm long, and 1.5 mm wide,  $\pm$  smooth, yellowish-white.

**Additional selected specimens (from 74 examined):**

**Western Australia.** 3 miles [c. 5 km] E of Dukin, Jun 1959, *Aplin 522* (CANB, PERTH); 25 miles [c. 40 km] S of Mullewa, Aug 1965, *Beard 4319* (CANB, PERTH); 43 miles [c. 69 km] SW of Yalgoo, Oct 1953, *Broadbent & Broadbent 1752* (CANB, PERTH); 82.5 miles [c. 133 km] E of Geraldton on Geraldton–Mullewa road, Mar 1968, *Carr 460* (MEL, PERTH); 0.5 km W of Pindar, c. 200 m N of Pindar–Geraldton Railway line, Sep 1985, *Conn 2039* (BRI, MEL); 34.5 km NE of Wubin on Payne's Find road, Aug 1976, *Coveny 7878 & Maslin* (PERTH); 3.6 km WSW of Calingiri road to intersection of Newdale road, Sep, 1983, *Cranfield 4282* (PERTH); Victoria location 8492, N of Perenjori, Apr 1979, *Cranfield 1257* (BRI, MEL, PERTH); Perenjori, Nov 1953, *Gardner 12156* (CANB, PERTH); c. 12 km SW of Mullewa, on road to Morawa, Sep 1988, *Henderson H3151* (BRI); c. 9 km NW of Three Springs, on The Midlands road to Mingenew, Sep 1988, *Henderson H3141* (BRI); c. 50 km direct NE of Perenjori, at 'Old Karara' station, Oct 1992, *Lyne 882 et al.* (BRI, MEL); 18 miles [c. 29 km] E of Pindar, on Geraldton–Mt Magnet road, Jul 1953, *Melville 4252 & Calaby* (MEL, PERTH); 'Tallering' Station, Nov 1981, *Mitchell 928* (PERTH); 17 miles [c. 27 km] S of Mullewa towards Morawa, Oct 1972, *Paust 1302* (CANB, PERTH); 50 km W of Mullewa along road to Geraldton, Oct 1986, *Roberts 739* (PERTH); 56.1 km from turn-off to Perenjori on Great Northern Highway between Paynes Find and Wubin, Sep 1982, *Ross 2753* (MEL, PERTH); beside Geraldton to Mt Magnet road, 14 miles [c. 23 km] E of Mullewa, Sep 1966, *Smith 66/410* (MEL, PERTH); c. 15 km S of Yuin Homestead toward Pindar, Oct 1975, *Weber 5092* (PERTH); 14 km S of Koorda, Mar 1961, *Wilson 6451* (PERTH).

**Distribution and habitat:** *Ricinocarpus velutinus* is confined to south-western Western Australia where it occurs from the Mullewa area south-eastwards to Merredin and Coolgardie (**Map 26**). It is recorded as growing on a variety of sandy soils, sometimes gravelly, in shrubland or open woodland communities.

**Phenology:** Flowers have been collected throughout the year particularly from August to October, fruits in January, May and from July to December.

**Affinities:** *Ricinocarpus velutinus* is similar to *R. trichophorus* but differs from that in having young shoots and inflorescences with a greyish-white indumentum, adaxial surface of leaf blades with a moderately dense indumentum of persistent stellate hairs and flowers with yellow petals.

**Typification:** In the protologue of *Ricinocarpus velutinus*, Mueller (1875) cited a single collection from the upper Irwin River [Western Australia] collected by J. Forrest. Three sheets (two at MEL [90951 and 90950] and one at K) with matching locality and collector data have been located amongst material on loan to BRI. The two sheets at MEL were annotated by Mueller with the name *R. velutinus*. All three sheets appear to be from a single collection. The sheet MEL90951 is selected here as lectotype of Mueller's name because the specimen is slightly more ample and better preserved than that on the other MEL sheet, whilst the specimen on the K sheet is a much smaller fragment than those on the MEL sheets.

Lander (1984) stated that the holotype of *Plagianthus monoica* had been destroyed in transit from Perth to Melbourne in the early 1980s but this, fortunately, is incorrect as the specimen is still extant and in MEL (90953).

**Ricinocarpus** sect. **Scissostylus** Gruning, in A. Engler, *Pflanzenr.* H.58: 48 (1913). **Type:** *Ricinocarpus stylosus* Diels.

Leaves with petiole appressed to branchlet. Inflorescences of a single flower or flowers umbelliform. Flowers with petals absent. Stigmatic limbs deeply 4- or 5-lobed.

**26. Ricinocarpus stylosus** Diels in L. Diels & E. Pritzel, *Bot. Jahrb. Syst.* 35: 335/336, fig. 40 (1904). **Type:** "Hab in distr. Coolagradie meridionali pr. Gilmores (a Lake Cowan occidentem versus) in fruticetis apertis arenoso-lutosus flor. et fruct. m. Nov. (D. 5272)" (holo: B  $\bar{\dagger}$ ; lecto [here chosen]: Illustration in Diels & Pritzel, *Bot. Jahrb. Syst.* 35: 336, fig. 40 (1904)).

**Illustration:** Grüning (1913: 49, fig. 9).

Monoeocious or dioecious, spreading, rounded **shrubs** to 2 m high or rarely a small tree to 5 m high (*Spjut 7277 et al.* (PERTH)). Young branchlets terete, glabrous, resinous. Older branchlets with surface becoming shallowly longitudinally reticulately fissured, dark brown. **Leaves** petiolate, spirally alternate; petioles 1–2 mm long, glabrous; blades linear to narrow-oblong, 6–10 mm long, 1–1.5 mm wide, with a length/width ratio of 6–10:1; adaxial surface glabrous,  $\pm$  smooth; abaxial surface puberulous with soft white stellate hairs  $< 0.1$  mm across; base cuneate; margins recurved to midrib so that only midrib of abaxial surface of leaf blade is visible; apex acute to obtuse, ultimately mucronate with extension from midrib; midvein obscure adaxially, abaxially raised with flat glabrous adaxial face; secondary venation obscure on both surfaces; marginal glands absent. **Inflorescences** of a single female flower, or  $\pm$  umbelliform with either 2–5 male flowers or one (rarely 2) female flowers surrounded by up to 4 male flowers, terminal on branchlets; bracts and bracteoles lanceolate, 3–5 mm long, glabrous. **Flowers** conspicuous; pedicel glabrous, usually resinous; calyx 4- or 5 (rarely 6)-lobed; disc a glandular ring. **Male flowers:** pedicel slender, 3–5 mm long; calyx glabrous and usually resinous abaxially, glabrous or puberulous with minute white stellate hairs mostly near margins adaxially, lobes triangular, 2.7–3.7 mm long, 1.5–2.3 mm wide, acute or obtuse at the apex; disc 0.3–0.4 mm long, dorsi-ventrally compressed, irregularly lobed, glabrous except for scattered stellate hairs, truncate distally; central column *c.* 2 mm long, with scattered minute stellate hairs; stamens *c.* 35; free portion of filaments *c.* 0.5 mm long, erect to spreading at anthesis, glabrous; anthers 0.6–0.7 mm long. **Female flowers:** with pedicel usually stout, 3–6 mm long; calyx persistent, glabrous and usually resinous abaxially, glabrous or puberulous with minute white stellate hairs mostly near margins adaxially, lobes triangular, 3–4 mm long, 1.5–3 mm wide, acute to obtuse at the apex; disc as for male flowers; ovary ovoid but 3-sulcate, *c.* 1.5 mm long, glabrous or sparsely stellate-pubescent, verrucose; style

$\pm$  obsolete; stigmatic limbs *c.* 2 mm long, glabrous; lobes spreading to  $\pm$  upwardly curving,  $\pm$  dorsi-ventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** subglobose, 7–8 mm long, 7–10 mm across, with scattered stellate hairs up to 0.1 mm across, rugose or verrucose, resinous, usually 3-seeded; calyx a quarter to half the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 5–5.3 mm long (including caruncle), *c.* 3 mm wide, 1.7–1.8 mm deep; testa brown to dark brown; caruncle  $\pm$  hemispherical, *c.* 0.7 mm long and 1.8 mm wide,  $\pm$  smooth, yellowish-white.

**Additional selected specimens (from 40 examined):**

**Western Australia.** 5 km NE of Norseman PO (Post Office), *c.* 1 km N of Eyre Highway, Aug 1974, *Beaglehole ACB49391* (MEL, PERTH); 45 miles [*c.* 72 km] S of Norseman, Jan 1970, *Bennett 3085* (PERTH); 9.2 km SSW of Norseman, just S of Woolyeenyer Hill, Oct 1976, *Chinnock 3327* (PERTH); 30 km E of Norseman, Oct 1992, *Corrick 11020* (MEL); 46 km S of Norseman on the Esperance road, Oct 1981, *Craven 7207* (CANB, MEL); 4 miles [*c.* 6 km] E of Norseman, Oct 1973, *Demarz 4620* (PERTH); 5.6 km E of Norseman on Eyre Highway, Sep 1997, *Donaldson 1795 & Flowers* (CANB); *c.* 35 km N of Widgeemooltha, along Eyre Highway, Sep 1968, *Eichler 20043* (PERTH); 22 miles [*c.* 35 km] southward from Norseman, Nov 1953, *Gardner 11158* (PERTH); S of Coolgardie, Oct 1955, *Gauba WA248* (CANB); *c.* 41 km SE of Coolgardie, on road to Norseman, Sep 1988, *Henderson H3170* (BRI); north base of Jemberlana Hill, 7 km NE of Norseman, Oct 1979, *Newbey 6158* (PERTH); 28 km NW of Norseman, Nov 1979, *Newbey 6245* (PERTH); 93 miles [*c.* 149 km] N of Norseman, Nov 1962, *Phillips WA/62 3305* (CANB, PERTH); just S of Norseman, Oct 1981, *Spjut 7277 et al.* (PERTH); *c.* 95 km E of Norseman, Oct 1969, *Whibley 3015* (PERTH); 4 km S of Daniell, Sep 1964, *Wilson 3178* (PERTH).

**Distribution and habitat:** *Ricinocarpus stylosus* occurs in south-western Western Australia where it is restricted to the Norseman district (**Map 27**). It is recorded as growing mostly on well-drained loam or clay soils in eucalypt woodland or open forest communities.

**Phenology:** Flowers have been collected from August to January, fruits in April and from August to December.

**Affinities:** *Ricinocarpus stylosus* is similar to *R. muricatus* Müll.Arg. and *R. verrucosus* Halford & R.J.F.Hend. in having apetalous flowers but differs from them in having

inflorescences of a single flower or umbelliform clusters of flowers and shorter leaves and petioles that are more or less appressed to the branchlet.

**Typification:** We have been unable to locate the Diels collection (D. 5272) referred in the protologue of *R. stylosus*. The Diels herbarium was held at B and destroyed during the Second World War. Searches for duplicates in other herbaria where duplicates may exist according to Stafleu and Cowan (1976) (BM, MEL and CANB), have been unsuccessful. Diels' description and illustration are clearly diagnostic and leave no doubt as to the application of the name. The illustration in the protologue is here chosen as the lectotype of Diels' name *R. stylosus*.

**Ricinocarpus** sect. **Apetalidion** Müll. Arg., *Linnaea* 34: 59 (1865); *Ricinocarpus* sect. *Polystaphylos* Grüning, in A. Engler, *Pflanzenr.* H.58: 43 (1913) *nom. illeg.* **Type:** *Ricinocarpus muricatus* Müll. Arg.

Leaves with petiole spreading from branchlet. Inflorescences racemose, usually of one or two female flowers basal on the axis with many male flowers distal to them. Flowers with petals absent. Stigmatic limbs deeply 2–4-lobed.

**27. Ricinocarpus muricatus** Müll. Arg., *Linnaea* 34: 61 (1865); *Roeperia muricata* (Müll. Arg.) Kuntze, *Revis. Gen. Pl.* 2: 619 (1891). **Type:** [Western Australia] Swan River–Cape Riche, in 1848, [J.] *Drummond* n. 85 (lecto [here chosen]: G-BOISS; isolecto: K [2 sheets]; G-DC n.v. [microfiche IDC 800-73. 2455: III. 2]).

**Illustration:** Grüning (1913: 45, fig. 8 A–C).

Monecious, erect to spreading **shrubs** to 2.5 m high; thinly to thickly viscid on most parts. Young branchlets  $\pm$  angular becoming terete with age, glabrous. Older branchlets with surface becoming longitudinally fissured, grey. **Leaves** sessile or shortly petiolate; petioles up to 1 mm long, glabrous; blades linear, (15–) 20–45 mm long, 1–2 mm wide, with a length/width ratio of (10–) 20–30:1; adaxial surface glabrous, with scattered tubercles; abaxial surface pubescent with soft stellate hairs up to 0.4 mm across; base cuneate;

margins recurved to midrib; apex obtuse to rounded and ultimately terminated with  $\pm$  sessile gland; midvein  $\pm$  obscure adaxially, abaxially raised and angular, glabrous on abaxial face; secondary veins raised abaxially; marginal glands sometimes present at base of blade, 1 per side of midrib, sessile, smooth, 0.2–0.3 mm across. **Inflorescences** racemose usually of one or two female flowers basal on the axis with 8–12 male flowers distal to them; primary axis 15–30 mm long, glabrous, smooth; bracts lanceolate or narrow-oblong, 2.5–4 mm long, glabrous, caducous. **Flowers** conspicuous; pedicel glabrous, calyx 4- or 5-lobed. **Male flowers:** pedicel slender, 1–3 mm long; calyx glabrous except for white crispate hairs along the margins distally, lobes elliptic, 2.3–3 mm long, 1.4–2 mm wide, obtuse to rounded at the apex; disc of 5 discrete glands; glands dorsi-ventrally compressed, fleshy, glabrous; central column, 2–3 mm long, glabrous; stamens 20–30; filaments 0.2–0.5 mm long, spreading at anthesis, glabrous; anthers 0.7–0.8 mm long. **Female flowers:** pedicel  $\pm$  slender, terete, 6–12 mm long; calyx persistent, glabrous, lobes narrow-ovate to broad-ovate, 2–4.4 mm long, 0.9–5 mm wide, acute to obtuse at the apex; disc a glandular ring, dorsi-ventrally compressed, fleshy, glabrous; ovary subglobose, 0.8–1.5 mm long, glabrous, tuberculate; style c. 0.3 mm long, glabrous; stigmatic limbs c. 3 mm long, deeply 2–4-lobed, glabrous; lobes spreading, dorsi-ventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** subglobose or ovoid, weakly to strongly trilobate, 5–7 mm long, 5–7 mm across, tuberculate to verrucose, glabrous, usually 3-seeded; calyx a third to half the length of mature fruit. **Seeds** obloid, c. 5 mm long (including caruncle), 3 mm wide and 2 mm deep; testa mottled greyish-white and lightly brown; caruncle  $\pm$  broad-conical, c. 9 mm long and 1.2 mm wide,  $\pm$  smooth, yellow-white.

**Selected specimens (from 42 examined):** **Western Australia.** Mt Ridley, Oct 1970, *Aplin* 4036 (PERTH); 420 mile peg, NW Coastal Highway, Aug 1967, *Ashby* 2235 (PERTH); Noganyer Soak, Dundas Rocks, Sep 1977, *Barker* 2578 (AD); 10 miles [c. 16 km] S of Norseman, Sep 1965, *Beaulehole* ACB13215 (MEL, PERTH); Murchison Gorge, near Hawks Head, Jun 1968, *Blockley* 639 (PERTH); 390.7 mile peg, Carnarvon



road [North West Coastal Highway], Sep 1974, *Demarz 5146* (PERTH); Mt Stirling, Jul 1941, *Gardner s.n.* (PERTH); Koolanooka Hills, Sep 1931, *Gardner 2673* (CANB, PERTH); near Z Bend, Kalbarri N.P., c. 30 km ENE of Kalbarri, Sep 1988, *Henderson H3145* (BRI); round picnic area in rocks at Dundas Rock, c. 23 km S of Norseman, Sep 1988, *Henderson H3173* (BRI); c. 37 km S of Dalwallinu, Jul 1980, *Hnatiuk 800038A* (PERTH); Wongan Hills, Aug 1980 *Kenneally 7462* (PERTH); *loc. cit.*, Jun 1983, *Kenneally 8791* (PERTH); Mt Caroline, 20 km SSW of Kellerberrin, Oct 1990, *Mollemans 3516* (BRI); 18 km E of Karroun Hill, Jul 1990, *Mollemans 2997* (CANB, BRI); Walyahmoning Rock, c. 60 km NW of Bullfinch, Sep 1982, *Newbey 9559* (CANB, PERTH); near Z Bend, Kalbarri N.P., Oct 1982, *Strid 20794* (PERTH); near Ross Graham Lookout, Kalbarri N.P., May 1968, *Wilson 6612* (PERTH); 8 km E of Ajana, May 1966, *Wilson 4128* (PERTH).

**Distribution and habitat:** *Ricinocarpus muricatus* is confined to south-western Western Australia from near the Murchison River south-east to Mt Ridley near Esperance (Map 28). It is recorded as growing in sandy to sandy loam soils, mostly associated with granite substrates, sometimes with lateritic substrates, rarely on sand dunes and sandstone substrates, in mixed shrubland, heathland and mallee communities.

**Phenology:** Flowers have been collected from April to November, fruits from July to October.

**Affinities:** *Ricinocarpus muricatus* is similar to *R. verrucosus*. For features distinguishing these two species, refer to the 'Affinities' section under *R. verrucosus*. *Ricinocarpus muricatus* is similar to *R. stylosus* in having apetalous flowers but differs from that in having racemose inflorescences and longer leaves with spreading petioles.

**Typification:** Müller (1865) cited two collections in the protologue of *R. muricatus*, namely "Ad Swan River (Drummond ser. 4 n. 85! et n. 218! in hb. Boiss." Both sheets are now located at G. Both sheets agree with the description in the protologue of *R. muricatus*. The better of these two collections (*Drummond n 85*) has flowers and fruit and is selected here as lectotype of Müller's name.

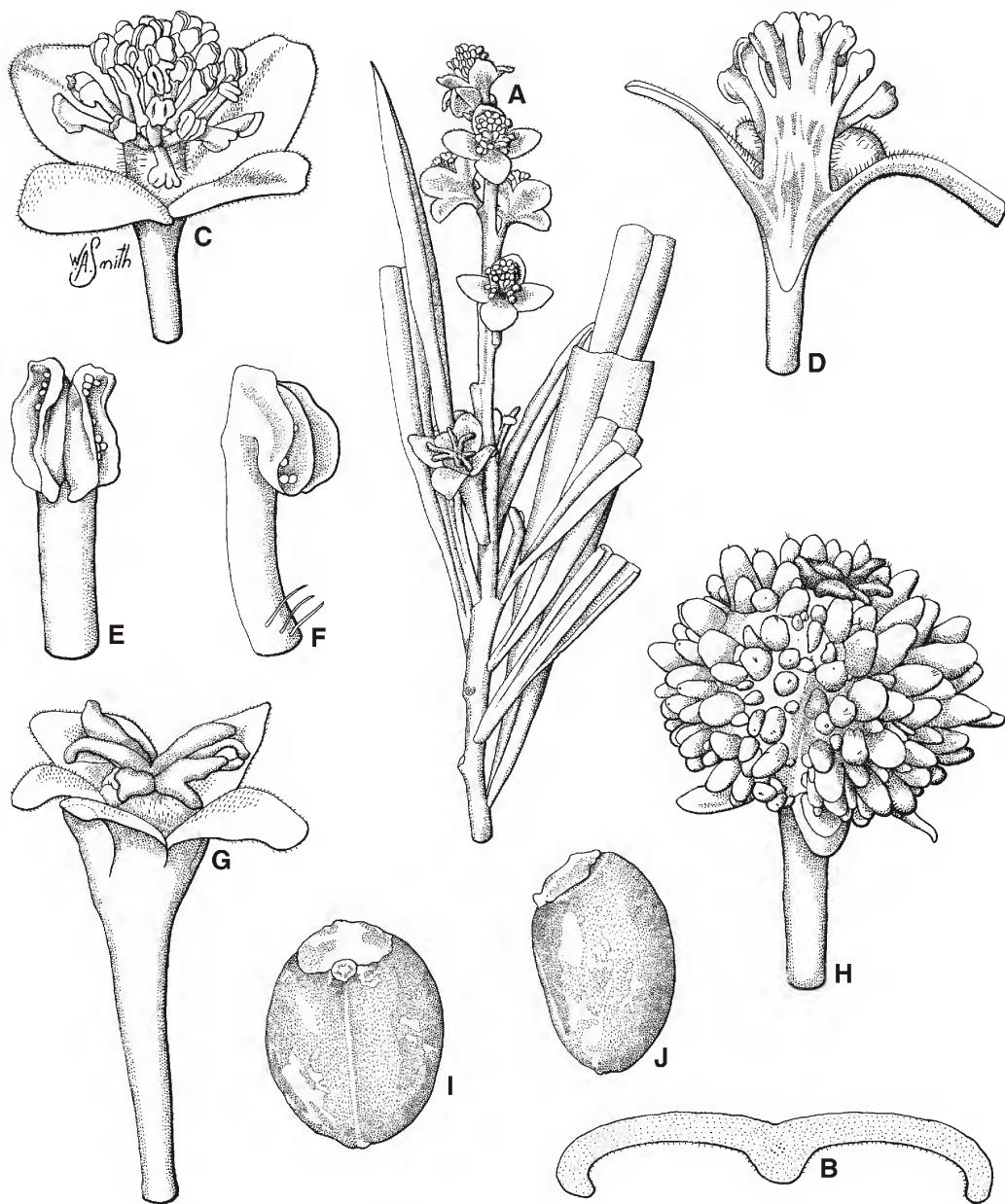
**Notes:** Collections (e.g. *Blockley 639* (PERTH), *Ashby 2235* (PERTH), *Wilson 4128* (PERTH), *Henderson H3145* (BRI)) from the north-eastern end of the species range have broad-ovate female calyx lobes and a more

deeply verrucose surface on the fruit. This variation is worthy of further investigation.

**28. *Ricinocarpus verrucosus* Halford & R.J.F.Hend. species nova** *R. muricato* Müll. Arg. maxime affinis sed foliorum lamina majore angusto-elliptica vel angustolanceolata non lineari in ambitu (45–100 mm longa × 2–4 mm lata non 15–45 mm longa × 1–2 mm lata), calycis lobis dense pubescentibus non glabris in pagina abaxiali et fructibus sparse pubescentibus non glabris differt. *R. verrucosus* floribus apetalis *R. styloso* Diels similis sed inflorescentiis racemosis non floris singularis vel umbellatis et foliorum lamina longiore (45–100 mm longa non 6–10 mm longa) et petiolo patenti non plus minusve ramulo appresso differt. **Typus:** Queensland. COOK DISTRICT: Mt Alto, c. 4 km SSW of Mt Carbine, 21 April 1989, *R.J.F.Henderson H3228* & *J.R.Clarkson* (holo: BRI; iso: DNA, CANB, MEL, NSW, K, distribuendi).

*Ricinocarpus* sp. (Mt Alto C.T.White 10633), Forster & Halford (2002: 73; 2007: 72).

Monoecious, multi-stemmed **shrubs** to 4 m high; thinly viscid on most parts. Young branchlets ± terete, glabrous. Older branchlets with surface becoming shallowly longitudinally fissured, ± black. **Leaves** shortly petiolate; petiole 1.4–2 mm long, glabrous; blade very narrow-elliptic or narrow-lanceolate, 45–100 mm long, 2–4 mm wide, with a length/width ratio of 11–30:1; adaxial surface glabrous and smooth; abaxial surface pubescent with soft stellate hairs up to 0.1 mm across; base attenuate; margins recurved; apex acute and ultimately terminated with sessile gland; midvein impressed adaxially, abaxially raised and rounded, glabrous on abaxial face; secondary veins raised abaxially; marginal glands sometimes present at base of blade, 1 per side of midrib, sessile, smooth, c. 0.1 mm across. **Inflorescences** racemose usually of one or two female flowers basal on the axis with 8–20 male flowers distal to them; primary axis 20–50 mm long, glabrous, smooth; bracts narrow-oblong, 2.6–3 mm long, glabrous, caducous. **Flowers** with pedicel glabrous; calyx 4- or 5-lobed; disc ± a glandular ring, dorsi-ventrally compressed, fleshy, lobed distally. **Male flowers:** pedicel slender, 2–3 mm long; calyx glabrous except



**Fig. 11.** *Ricinocarpus verrucosus*. A. flowering branchlet  $\times 2$ . B. transverse section of leaf  $\times 12$ . C. side view of male flower  $\times 8$ . D. longitudinal section of male flower  $\times 8$ . E. face view of stamen  $\times 30$ . F. side view of stamen  $\times 30$ . G. side view of female flower  $\times 6$ . H. side view of fruit  $\times 4$ . I. ventral view of seed  $\times 6$ . J. side view of seed  $\times 6$ . A–G from Clarkson 8215 (BRI); H from Henderson H3228 & Clarkson (BRI); I, J from Gray 6628 (BRI). Del. W.Smith.

for dense minute hairs distally abaxially, densely pubescent adaxially, lobes ovate to elliptic, 2.5–3.3 mm long, 2.2–2.7 mm wide, obtuse to acute at the apex; disc hairy; central column 2–3.3 mm long, tomentose; stamens c. 40; free portion of filaments c. 1.3 mm

long, erect to spreading at anthesis, glabrous or sparsely hairy; anthers 0.6–0.8 mm long. **Female flowers:** pedicel stout, 5–10 mm long, glabrous; calyx persistent, indumentum as for calyx of male flowers, lobes narrow-ovate to ovate, 3.4–4.2 mm long, 1.5–2.9 mm

wide, acute at the apex; disc glabrous; ovary subglobose, *c.* 2 mm long, stellate-pubescent, verrucose; style  $\pm$  obsolete; stigmatic limbs spreading, 2–2.5 mm long, deeply 2- or 3-lobed, glabrous adaxially, stellate-pubescent proximally abaxially; lobes spreading, dorsi-ventrally compressed but grooved abaxially, verrucose adaxially, smooth abaxially. **Fruits** subglobose, 6–8 mm long, 9–10 mm across, verrucose, sparsely hairy with stellate hairs, usually 3-seeded; calyx  $<$  a third the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, *c.* 5 mm long (including caruncle), 3.5 mm wide and 3 mm deep; testa dark red-brown; caruncle  $\pm$  hemispherical, *c.* 4 mm long and 2 mm wide,  $\pm$  smooth, yellow-white. **Fig. 11.**

**Additional selected specimens:** **Queensland.** COOK DISTRICT: Right-hand Falls, Mt Carbine, Nov 1967, *Cassels CAIRNS14893* (BRI); Mt Alto, *c.* 4 km SSW of Mt Carbine, Feb 1990, *Clarkson 8215* (BRI); *loc. cit.*, Feb 1990, *Clarkson 8214* (BRI); McLeod River, between falls and Mount Spurgeon road crossing, Dec 1988, *Fell DF1542* (BRI); 1.6 km E of Flat Hill, Cape Melville N.P., May 1993, *Fell DGF3221* & *Stanton* (BRI); *loc. cit.*, May 1994, *Fell DGF4355* (BRI); Bakers Blue Mountain, Font Hills, Feb 1996, *Gray 6628* (BRI); Mt Alto, near Mt Carbine, Sep 1936, *White 10633* (BRI).

**Distribution and habitat:** *Ricinocarpus verrucosus* is confined to north-eastern Queensland in Cape Melville National Park, and the Mount Carbine district north of Mareeba (**Map 29**). It is recorded as growing mostly amongst granite boulders on rocky hillsides, cliff-lines or on rocky stream banks, often in open woodland communities fringing vine thickets. It is also recorded on dissected ferruginous sandstone.

**Phenology:** Flowers have been collected from February, May, September to November, fruits from February.

**Affinities:** *Ricinocarpus verrucosus* is similar to *R. muricatus* but can be distinguished from that species by its larger leaf blades which are narrow-elliptic or narrow-lanceolate rather than linear in outline (45–100 mm long  $\times$  2–4 mm wide compared with 15–45 mm long  $\times$  1–2 mm wide), its calyx lobes densely hairy (versus glabrous) on the abaxial surface, and its sparsely hairy (not glabrous) fruit. *Ricinocarpus verrucosus* is similar to *R. stylosus* in having apetalous flowers but

differs from that species in having racemose inflorescences, not of a single flower or umbellate, and leaves with a longer blade (45–100 mm long not 6–10 mm long) and a spreading petiole, not more or less appressed to the branchlet.

**Etymology:** The specific epithet is from Latin, *verrucosus* (warty), and refers to the warty texture of the surface of the fruit of this species.

### Excluded names

*Ricinocarpus major* Müll.Arg., *Linnaea* 34: 59 (1865) (*'Ricinocarpus'*); *Roeperia major* (Müll.Arg.) Kuntze, *Revis. Gen. Pl.* 2: 618 (1891). **Type:** in Tasmania, *Verreaux 112* (holo: G-DC [microfiche IDC 800-73. 2455: I. 3]).

A specimen at MEL [2066058] may be a fragment (leaves only) of the *Verreaux* collection at G-DC. A floral diagram of a female flower in pencil is attached to the sheet with a note “Copied von der Etiquette in hb DC, *Ricinocarpus major*” (copied from the label in herb. de Candolle). However, there is no such diagram with the specimen illustrated on the microfiche. Examination of the microfiche and the fragment on the MEL sheet suggest that the taxon it represents does not belong to Euphorbiaceae.

*Ricinocarpus mitchellii* Sonder, *Linnaea* 28: 563 (1857) (*'Ricinocarpus Mitchellii'*); *Bertya mitchellii* (Sond.) Müll.Arg., *Linnaea* 34: 63 (1865); *Bertya mitchellii* (Sond.) Müll. Arg. var. *mitchellii*, Gruning in A.Engler, *Pflanzenr.* H.58: 61 (1913) = *Bertya oleifolia* Planch., *fide* Halford & Henderson (2002).

*Ricinocarpus neocaledonicus* S.Moore, *J. Linn. Soc., Bot.* 45: 394 (1921) = *Baloghia neocaledonica* (S.Moore) McPherson, *fide* McPherson & Trel (1987).

*Ricinocarpus tasmanicus* Sonder & F.Muell., *Linnaea* 28: 562 (1857) = *Bertya tasmanica* (Sonder & F.Muell.) Müll.Arg., *fide* Halford & Henderson (2002).

*Ricinocarpus* sect. *Amonodiscus* Müll.Arg., *Linnaea* 34: 59 (1865). **Type:** *Ricinocarpus major* Müll.Arg.

See under *Ricinocarpus major* above.



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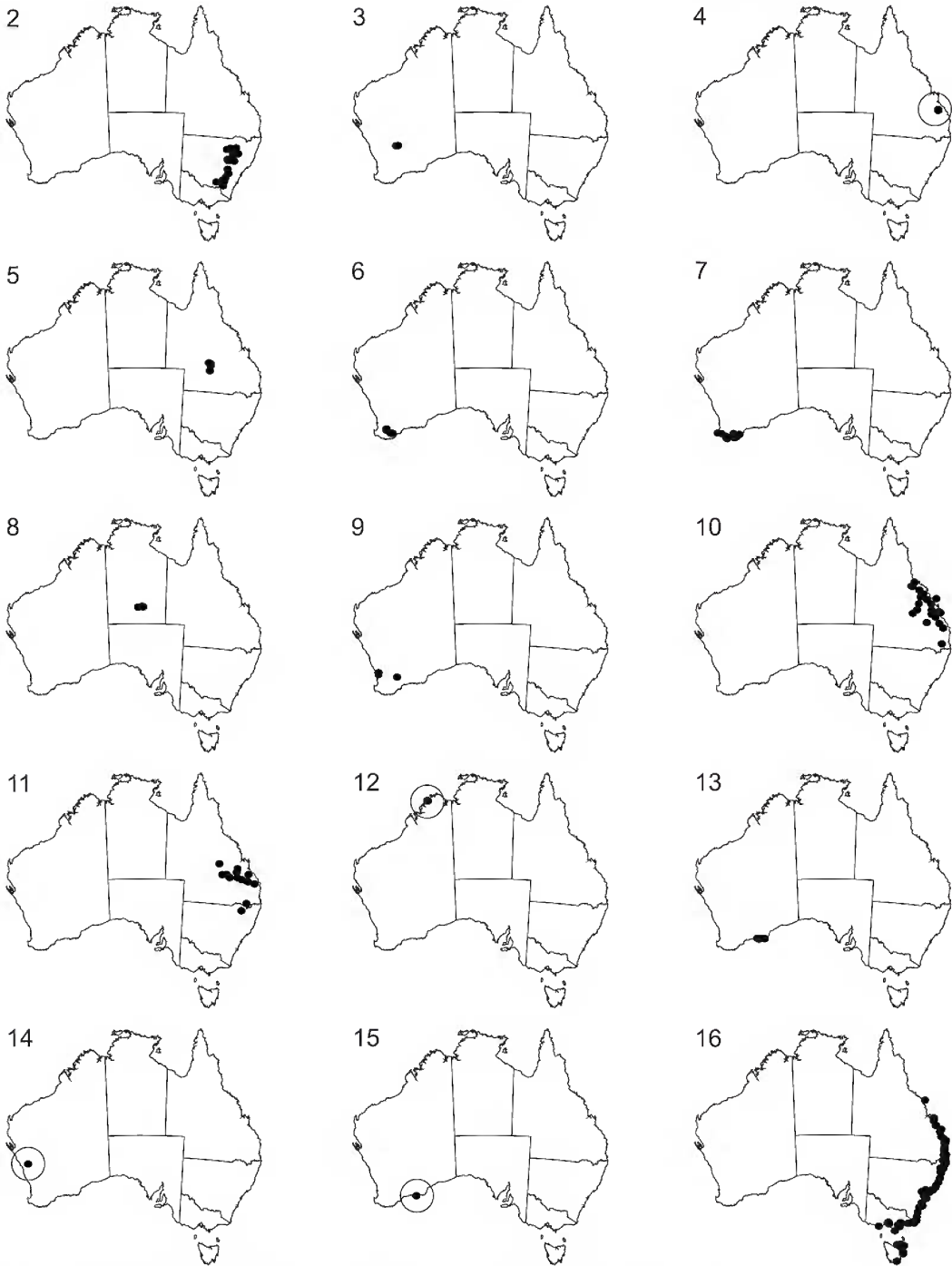
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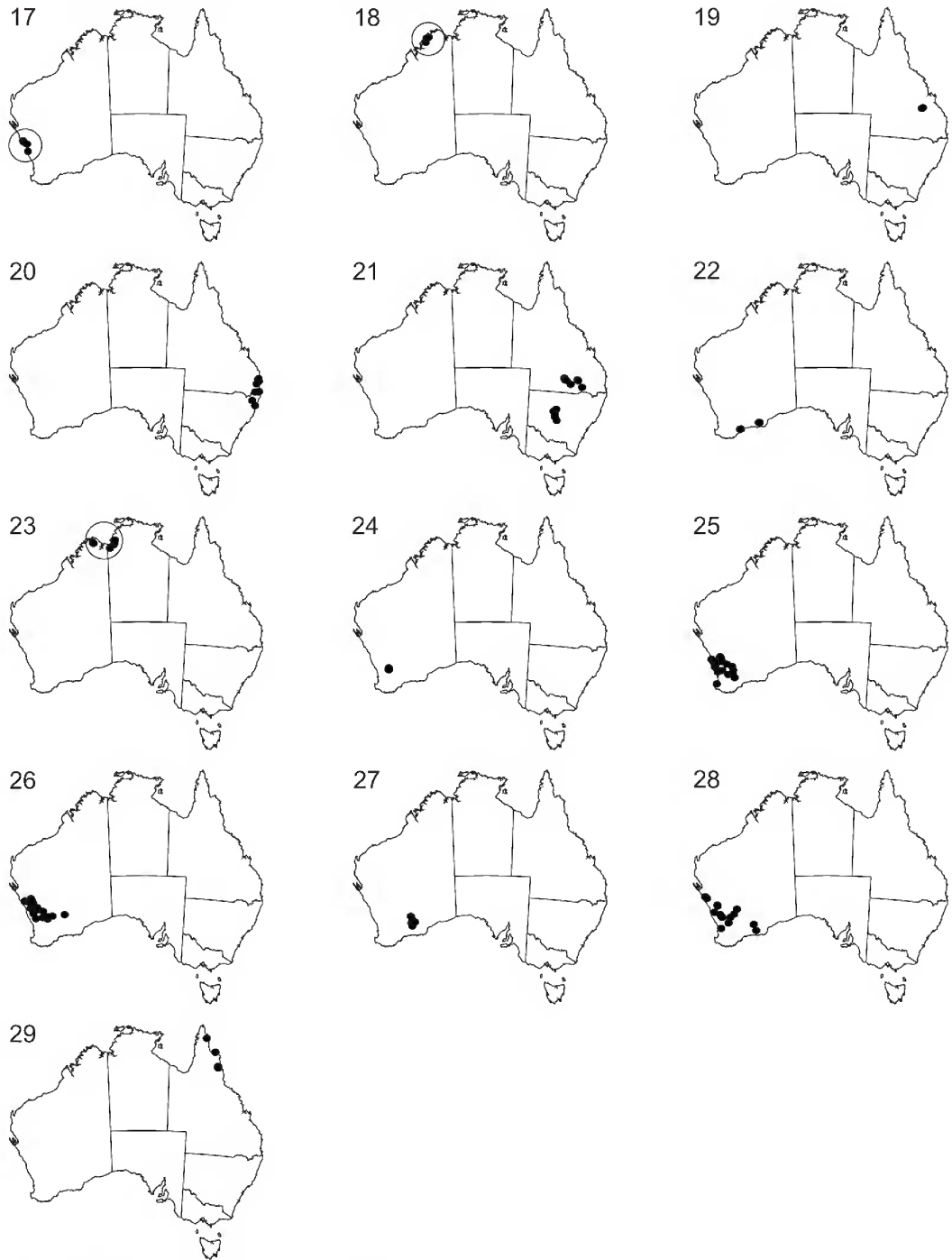
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**Maps 17–29.** Distribution of *Ricinocarpos* species. 17. *R. psilocladus* 18. *R. rosmarinifolius* 19. *R. ruminatus* 20. *R. speciosus* 21. *R. trachyphyllus* 22. *R. trichophorus* 23. *R. trichophyllus* 24. *R. tuberculatus* 25. *R. undulatus* 26. *R. velutinus* 27. *R. stylosus* 28. *R. muricatus* 29. *R. verrucosus*.